ELECTRICAL REVIEW

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Plant Maintenance

Prevention, not Cure, the Main Consideration

GOOD design and sound workmanship in construction achieve only part of their purpose unless the apparatus produced can easily be kept in running order or unless the arrangements for its maintenance are adequate. This should be a truism, but unfortunately there is evidence enough that its importance is not recognised as it should be in industry as a whole.

Lack of appreciation of the value of first-class maintenance may be due to the unobtrusive nature of the work, except as an expense which is of the same kind as insurance. Attention is generally drawn to the subject only on the infrequent occasions of breakdown. Yet a breakdown, however quickly and ingeniously it may be rectified, may really be an indication of a defective maintenance organisation. In short, the object of maintenance is not so much to be able to carry out repairs efficiently as to prevent their occurrence, as is pointed out in an article in this issue by Mr. H. Greaves, who emphasises the need for continuous inspection in accordance with definite schedules.

Organisation and Experience

How much is involved in the organisation of a maintenance department in a factory and the extent of the engineering experience that is necessary to secure continuity of electrical service was shown in some detail by Mr. J. Southern in the paper which he read before the Association of Supervising Electrical Engineers, a report of which we gave last week. The factory in question is larger and the staffing and repair equipment more elaborate than would apply in many instances, but there should not be much difficulty in modifying the scheme to suit individual requirements. Reference was made during the subsequent discussion to the great help available from manufacturers' service departments in normal times.

The great range of technical knowledge necessary for maintenance, which is inseparably wrapped up in the layout of the installation and its extension from time to time, is clear from the variety of instances cited by the author. It is also evident that when considering the purchase of new equipment high marks should be given to robustness and to features that facilitate maintenance. This applies to lighting as well as to motive power.

Shortcomings of Apparatus

One of the most useful sections of the paper is that which criticises apparatus from the user's point of view. Switch-fuses come in for some adverse comment; so does the flimsiness of the toggle mechanism of some of the smaller switches, the suggestion being made that switch handles should be of malleable- instead of cast-iron. Complaint is made of the scanty room allowed for the wiring of starters and of the inaccessibility of small motors for machine tools, which are often placed where oil and swarf find their way into the windings.

Another cause of concern that calls for investigation is the seepage of liquid into the windings of coolant-pump motors. Those who have experienced the common

difficulty of lubricating the pulley-end bearing of motors will no doubt applaud Mr. Southern's suggestion regarding the fitting of an extension oil pipe coming out clear of the pulley. It is the province of the electrical maintenance engineer to devise a system which will enable close attention to be given to points like these as well as to detecting defects due to wear and tear. The status accorded him should be commensurate with his responsibility for preventing loss of output, the value of which on one occasion only may be infinitely more than the cost of running his department.

Public Demand

REFERRING to proposals for the reorganisation of the electricity supply industry (a subject which we pursue further in this issue), the *Electrical Trades Journal* (E.T.U.) says that "the industry will pass from a public utility to a public service only as public demand grows strong enough to enforce it." Without pausing to discuss the distinction drawn between public utility and public service, we again maintain that the public demand is for a good and cheap electricity supply and generally speaking it is not being disappointed. Any public demand for public control is engendered mainly by politicians, who raise hopes of an electrical Paradise which may be shattered by collision with hard facts.

Rival Courtship

LAST year negotiations were proceeding between Ashton - under - Lyne Corporation and the Stalybridge Board with a view to the acquisition by the Board of the municipal electricity undertaking. Since then little has been heard of the course of the discussions until the rather surprising announcement that a proposal of "marriage" with the local gas company is being considered. In the negotiations with the Stalybridge Board the Corporation asserted its desire to have a voice in the distribution of electricity in the town. The gas company proposes to provide this by the Corporation appointing three directors (a somewhat unorthodox procedure). Such a mixture of municipal and company control over a joint gas and electricity undertaking surely contains all the elements of an uneasy partnership. The Corporation, however, has indicated a preference for a form of public utility administration of both the gas and electricity undertakings.

Consumers' Meter Reading

THE recent decision to abolish the business reply postal service may seriously inconvenience electricity supply undertakings which have adopted this system to encourage consumers to read their own meters and so minimise the number of official meter readers required. Where this arrangement has been introduced it has been found that the consumers have responded well and the effect of the withdrawal of these postal facilities, in the opinion of one important supply company, will inevitably mean that additional meter readers will have to be engaged. The company hopes that the postal authorities will reconsider the matter in relation to such valuable services as this. The official reply will probably be that undertakings can stamp reply cards in the ordinary way.

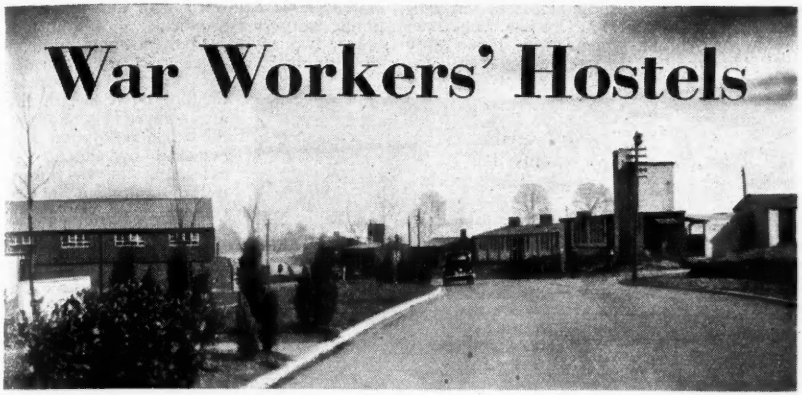
Voltage Regulation

EXPERIENCE with synchronous condensers indicates that their cost need not be as much as might appear at first glance. Mr. J. N. Robertson, in his chairman's address to the I.E.E. East-Midland Sub-Centre, cites a case in which by under-excitation at light loads, in order to allow a suitable value of wattless current to flow at all times in a 50-mile 66-kV overhead line, with the aid of on-load tap changing on the transformers, the voltage on the 11-kV side was kept within the permissible voltage drop by a machine having a kVA output only some 35 per cent. of that which would have been required for correcting power factor only on heavier loads.

Test Lamps

REPORTS of shocks and burns due to faulty assembly of home-made elementary testing equipment are commoner than they ought to be. The safest type to use (other than sets purchased complete) consists of a perforated box containing two lamps in series protected by double-pole high-rupturing-capacity fuses. The insulation of the leads should, of course, be above suspicion and should be carried up to within $\frac{1}{4}$ in. of the contact spikes.

War Workers' Hostels



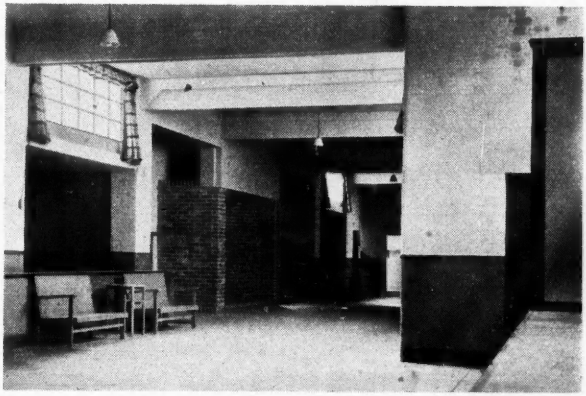
Diverse Electrical Equipment for Cooking and Other Services

THE dispersal of war factories, added to the already severe housing shortage, has created something of a problem for those responsible for the accommodation of war workers, transferred from one part of the country to another. The position is, however, being greatly alleviated by the provision of a number of special hostels operated by the National Service Hostels Corporation on behalf of the Ministries of Labour and National Service, Supply, and Aircraft Production.

Recently we had an opportunity of visiting several of these in the Midlands and seeing to what a great extent the high degree of electrification has contributed towards the comfort, health and convenience of the residents, not to mention speed in the construction of the premises, which is generally reckoned at about six months from start to finish.

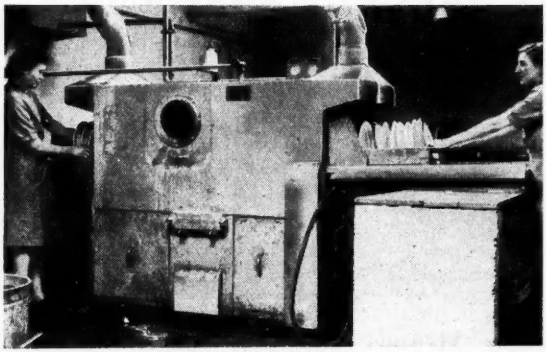
Although all the hostels are planned on much the same lines with the same standard of comfort and facilities for recreation, each new one as it is erected differs slightly from its predecessors owing to the incorporation of improvements resulting from the experience obtained. Generally speaking, the hostels are in two sizes designed to accommodate either 500 or 1,000 persons. Prefabricated concrete slabs combined with brickwork are utilised extensively in the construction, and the layout provides for a central group of buildings, comprising administrative block, assembly hall, dining-room, lounges, library, recreation rooms, etc., with the sleeping quarters (huts accommodating 48 persons, twenty-four each side of an air-raid shelter) radiating from them.

In the most recent hostels the entrance to the administrative block and assembly hall is arranged just like the reception hall of a luxury hotel, with reception office, entrance lounge (with electric fire), cloakrooms, telephone booths, post office, and a small but



Entrance hall of one of the hostels

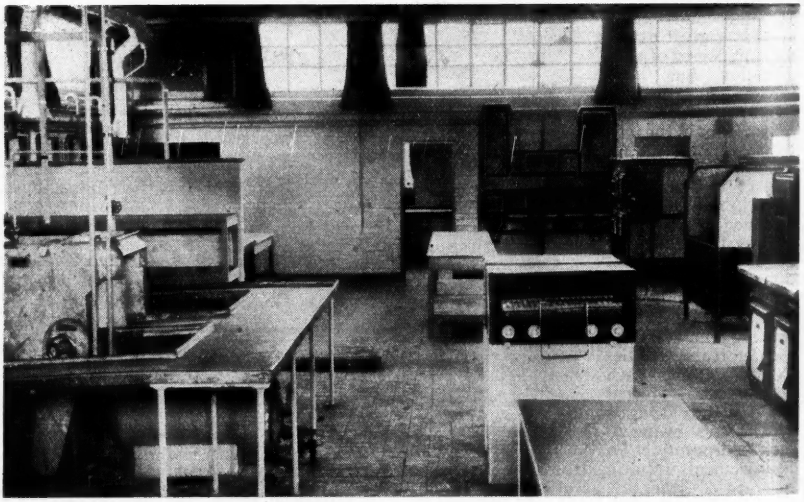
well-stocked general shop. Here, as throughout the hostels, expert advice has been taken as to the colour scheme with remarkably attractive results. In one entrance hall, for instance, there are blue doors and skirting, with the lower part of the wall pink and the top part buff, a yellow strip separating the two. The buff ceiling is relieved by beams of yellow. Another typical colour scheme in a tea bar adjoining an assembly hall employs a dark blue skirting with light blue and pink walls and a beige ceiling.



This washing-up machine can deal with 3,000 pieces an hour

Orange curtains, stage front and hot water radiators, with blue forms and tables, give a gay appearance to the largest assembly hall we were shown. Accommodating 400 persons seated, it is equipped with film projectors, public address equipment, spot and footlights, two rows of batten lights complete with dimmer and electric water heaters backstage. For warming the hall 1-kW electric fires are arranged in pairs around the walls, ventilation being achieved by electric fans extracting the air through ducts concealed in the ceiling. For the smaller hostels the halls are intended to seat about 200. The equipment here is not quite so comprehensive, but in all cases facilities are provided for presenting film and stage shows.

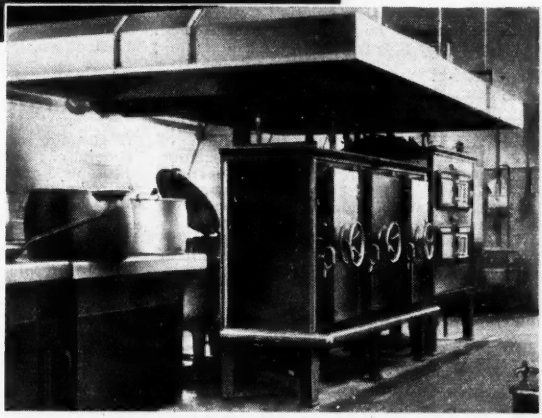
No complaints can be raised about lack of entertainment, for a resident welfare and social manager arranges something every night, either cinema shows (3d.), E.N.S.A. performances, dances or whist-drives, etc. For those to whom these do not appeal there are always the lounges, games rooms (both noisy and quiet !), library and writing-rooms, all of which are fitted with electric panel fires, tastefully built into brickwork surrounds, to supplement hot-water radiators. Incidentally, pull switches, attached direct to the ceiling conduit, are employed here for the



One of the larger kitchens, showing washing-up machines, salamanders, ovens and fish fryer

lighting to avoid any risk from possible dampness in the concrete slab walls.

As might be expected, the canteens provide the greatest scope for the use of electrical appliances. Apart from steam hotplates and boilers for vegetables, stews, etc., the entire kitchen equipment is electric. Though the canteens are of various sizes, seating from 300 to 500, the basic installation is more or less the same, the larger ones, however, having further assistance provided in the form of washing machines, etc. Four G.E.C. roasting ovens (30 kW each) with hotplates and grills on top; two 2-tier Benham



Part of the equipment in one of the smaller kitchens with (right) roasting and pastry ovens

pastry ovens (24 kW each); a Creda bain-marie and 3-pan fish fryer; Jackson salamander and stockpot ring; three Frigidaire refrigerators for meat (150 cu. ft.), fish (150 cu. ft.), and dairy produce (100 cu. ft.); a Crypto potato peeler and mixer; a Hobart mixer and a Peerless potato chipping machine all serving one of the smaller canteens seating about 200 persons, may be taken as a typical installation. The larger kitchens have perhaps another oven for roasting, another salamander, two fish fryers back to back and a washing-up machine to cope with the extra work entailed. Ventilator extractors for removing hot air and steam are provided over each group of apparatus.

Univectair unit fan heaters incorporating steam coils are used for heating some of the larger canteens. The tea bars adjoining the lounge and assembly halls have instantaneous electric water heaters with milk and coffee heaters on each side; some of these bars have small B.N.E. table cookers for snacks, etc. Electric fires and domestic type electric cookers are fitted in the managers' bungalows and sick-bays, the latter also having sterilisers and water heaters. In the laundry for the use of the residents there are a dozen or so electric irons, in some cases a wash boiler, and a steam heated drying room with extract fan. Such apparatus as vacuum cleaners and floor polishers are, of course, in constant service too.

Each hostel has a maximum demand of somewhere around 100 kVA. It makes little difference from the electrical point of view whether 500 or 1,000 persons have to be looked after, since the greater part of the load is for the kitchens, the equipment and operation of which is practically identical in every case. The average cost of electricity for all purposes works out at between 9d. and 1s. per head per week.

For their 25s. a week (only 20s. for women) inclusive charge the residents get, besides their accommodation and full use of the entertainment and other facilities provided, two meals a day on weekdays (breakfast and main meal), and three on Sundays (with a high tea). To cater for night as well as day workers the canteens are open from 3 a.m. to 11.30 p.m.

I.E.E. News

Re-arrangement of Premiums

FOR some time past it has been felt that the procedure for the award of premiums requires revision and the recent increase in the number of Sections of the Institution has brought the matter to the fore. The Council has therefore rearranged the list of premiums and has decided that the general papers (*i.e.*, other than Section papers) shall be treated for the purpose of the award of premiums similarly to Section papers and specific premiums allocated to them.

A revised list of premiums in three groups is given in the April *Journal* and it is noted that in Group A.—Premiums for All Papers, are the Institution (£50), Kelvin (£25) and John Hopkinson (£25) Premiums, all of which have been increased in amount, as has the Ayrton Premium (£20) (Group B.—Premiums for Non-Section Papers and Section Papers). In the latter group there is the new Llewellyn B. Atkinson Premium (£10).

Three premiums in the same group, previously unnamed, now have the following appellations:—Measurements Section, Mather Premium (£10); Transmission Section, John Snell Premium (£10); and Installations Section, Swan Premium (£10). Group C contains premiums for specified award, covering the Fahie, Paris Exhibition 1881, Webber and "Overseas" Premiums and it is stated that the award of one or two extra premiums (£5) may be made in special circumstances for papers on any subject.

Any paper accepted by the Council for publication in the *Journal*, whether it is read at a meeting or not, is eligible for a premium. All papers, *i.e.*, non-Section and Section papers, will be considered not only for the appropriate premiums in Group B but also for the premiums in Groups A and C, but no paper can be awarded more than one premium.

In addition to single papers, a series of papers published over a period of years, no one of which has justified an award, may be considered in connection with the award of premiums.

Overseas Hospitality

The *Journal* reminds members who may need to travel abroad that certain reciprocal arrangements exist by which privileges of overseas institutions are extended to them. The bodies concerned are the American Institute of Electrical Engineers, the Institute of Radio Engineers, the Engineering Institute of Canada, the South African Institute of Electrical Engineers, the Association of Chartered Engineers in Iceland and the Turkish Engineering Society. It is hoped to make similar arrangements with other overseas engineering institutions.

Examiners and Assessors

The Institution's Education and Examinations Committee desires to compile a list of corporate members who would be prepared to act as examiners for the associate membership examination or assessors for the National Certificate examinations. Fees are payable for the work and the Secretary asks members who are willing to act to notify him of their qualifications and the subjects with which they would like to deal, a list of which is given in the *Journal*.

Testing Insulating Materials

DETAILS associated with the control of quality of materials used for insulating purposes, together with special features of tests devised to ascertain the performance of dielectric substances under unusual conditions of service, are discussed in a paper prepared by Mr. A. R. Dunton (Metropolitan-Vickers Electrical Co., Ltd.) for the Measurement Section of the Institution of Electrical Engineers.

For instance the selection of varnish for withstanding humidity is assisted by testing samples, prepared in the manner described by the author, clamped between two hollow electrodes filled with water. Specially constructed apparatus enables six specimens to be simultaneously subjected to DC stress at 250 or 500 V, deterioration allowing leakage current to pass, which is used to operate a sensitive relay for stopping electric clocks which control the circuit. This procedure permits records to be made of the relative resistance to moisture of selected varnishes, or one sample to be compared with another; it has already established the superiority of pigment varnishes to the clear varieties, which fact has been confirmed by long-period power-factor graphs.

The addition of drying agents appears to be generally detrimental; oil-modified bakelite and glyptal varnishes are in existence which give very good results; varnishes made up of a blend of gilsonite with china wood oil, or linseed oil, generally resist moisture exceptionally well. Multiple dips in thin varnish tend to be superior to a single dip in a thick varnish and oven baking is generally much better than air drying.

The author tabulates various heat endurance tests, with references to appropriate B.S.S., while an appendix to the paper contains a schedule of recommended tests to be applied to materials entering a factory. Reference is made to devices for determining plastic yield and to instruments for selecting paper for making synthetic resin varnished products, while a table assists in the identification of synthetic fibres in relation to substitution for natural silk.

A.S.E.E. Papers

THE three prizewinning entries in the Branch Papers Scheme of the Association of Supervising Electrical Engineers are to be read at a meeting at the Lighting Service Bureau, 2, Savoy Hill, W.C.2, on May 18th (6.15 p.m.). The papers are "The Retail Store as a Factor in the Electrical Industry," by Mr. A. W. Jervis; "An Introduction to the Starting of Motors," by Mr. W. Acton; and "The Treatment of Water for Public Supply," by Mr. C. Hill.

Improving Electricity Supply—III

Alternatives to Nationalisation or Regionalisation

RANGED against the advocates of nationalisation or regionalisation of the electricity supply industry there is still a very large body of opinion in favour of effecting reorganisation on the less drastic lines of the McGowan Report (subject to such modifications as have been shown to be desirable in the period that has elapsed since its publication), though regarding it not so much as the final conception but as a step towards a more natural scheme.

In last week's article we dealt with the advantages and disadvantages of nationalisation or regionalisation of the electricity supply industry. In this instalment we put forward other proposals which have been made

The war has shown that there is nothing fundamentally wrong with the industry, and for that reason it is felt by many intimately concerned that there can be no advantage in any radical change. The ideal conditions aimed at in this quarter are Government regulation in the interest of consumers, with perhaps regional control of the raising of capital, but perfect freedom for individual units to develop in the way best suited to their locality.

Municipal and Company Control

Doubts exist, however, as to whether the present system of combined municipal and company operation of the industry is yielding the best results to the public. We do not propose once more to go deeply into the controversial question as to which of the rival forms of ownership is better. In these days there is in some quarters a tendency to decry any form of private ownership of utility undertakings on account of the profit motive, but so long as the companies continue to do a good job and so long as their dividends are kept to reasonable limits (and many companies appear to have no objection to excess profits, if any, going to the local authority or being used to reduce charges and to improve electrical services) it is by no means certain that anything would be gained by public ownership.

The country owes much to the companies for their pioneering work, especially in developing areas which few municipal undertakings would have thought sufficiently remunerative or worth the trouble and expense of obtaining the necessary Fringe Orders, and it is only just to give them due consideration.

Among defects in municipal control (all pointed out to us by municipal engineers) are the facts that as at present constituted municipalities have not necessarily the right boundaries for electricity supply, since they generally exclude all but the most adjacent rural areas; that the electricity undertakings are sometimes used as bargaining tools for party purposes by local councils; that local councils have not the specialised knowledge requisite for controlling such an important service; that councils owning both gas and electricity undertakings tend to "go slow" in matters relating to electrical development; that the undertaking is looked on as a sort of "milch cow" readily supplying contributions to the relief of rates and town hall expenses (there is seldom, if ever, reciprocal payment for advice, etc., rendered by the undertaking to other sections of a council's organisation); and that the undertaking is frequently excessively assessed for rating purposes. At the time of the consideration by electricity supply undertakings of the proposals of the White Paper on Electricity Distribution, one municipal undertaking operating in an area with approximately a half a million inhabitants estimated that the annual loss to the revenue of the local authority if the undertaking were transferred to a distribution board would amount to £37,500.

Size of Distribution Area

Whatever form of co-ordination of the industry is adopted, for it seems generally agreed that some form of merging of undertakings is necessary, the question of the ideal size of a distribution area has to be settled. Most, though not all, of the advocates of nationalisation or regionalisation consider that for technical administration and service reasons the C.E.B. areas would be too large and unwieldy for handling the distribution side, and that in any case these areas are not the right ones geographically since industrial and rural districts are not distributed evenly all over the country. In any case, the larger an organisation is, after a certain stage, the more inefficient it tends to become, and there is no point in carrying centralisation so far that areas have to be split up again into sub-areas.

By the adoption of supply areas of a size which would obtain the benefits of unification

while maintaining efficient management throughout, a certain degree of competition between areas would be encouraged, and at the present stage of development the existence of a large number of undertakings permits a good deal of most useful experimental work to be undertaken. As a rule engineers consider that, taking service to the consumer as the primary consideration (as it should be) the optimum area in which local control can satisfactorily be exercised is one serving, say, 30,000–50,000 consumers and covering 200–400 sq. miles embracing both urban and large rural territories. The density of population, geographical features of the area, and type of load available must, however, have considerable influence on the size of an area and the number of consumers that can conveniently be served. At all events it is almost unanimously agreed that every endeavour should be made to obtain the greatest possible diversity of load, with each area containing a potential balance of power, domestic, urban and rural consumers.

By operating in larger units and by so arranging each of the areas as to include both urban and rural districts, the provision of facilities in the less remunerative areas is made more readily practicable, since a comparatively small subsidy from the town areas will make a substantial contribution towards reducing costs to rural consumers. Incidentally, it has been pointed out to us that, contrary to Lord Portal's suggestion in the House of Lords, no immediate improvement in diversity of load has generally been secured by the amalgamation of areas: improved diversity is mainly brought about by increasing the applications of electricity.

Position of Small Undertakings

Size is not, however, a satisfactory criterion of efficiency. There are small undertakings with results which many a larger undertaking might envy, and it is by no means always possible to show that conditions and prices in a small undertaking would be improved if a larger undertaking took it over. The acquiring undertaking also has to find additional capital.

In some respects, however, small undertakings are indisputably at a disadvantage as compared with large ones. For instance, their financial resources do not permit them to have on their staff a specialist personnel so necessary to deal with the many diverse problems which to-day confront the supplier. If small undertakings were combined either with each other or with larger undertakings, one group of technical experts could cover the whole of them. There is also a considerable duplication of effort among small undertakings in maintaining separate repair shops, test rooms, etc., which are much better run collectively, while an unnecessary multiplication of types of apparatus, such as transformers, switchgear, cables, installation accessories, cookers, etc., is created by individual engineers each having their own particular ideas and fancies. Moreover, large undertakings, having more funds available, are generally in the position to provide better service, including duplicate supplies and voltage regulation.

Generally speaking, the undertakings most anxious to retain their own identity and not be merged with other undertakings are those operated by companies and the smaller municipalities, the former considering that they deserve some consideration for their enterprise, and the latter being proud (and often rightly so) of their achievements, jealous of any interference, and liable to think rather on parochial lines. Strangely enough, the councils most loth to lose control of their undertakings include some with Labour majorities, which presumably would be expected to support nationalisation.

This tendency was manifested by a resolution passed by six hundred local authorities opposing the continuation of regional control of local administration after the war. Some of the large cities, taking the probably correct view that they give their consumers a service which would not be improved by amalgamation, also strenuously oppose any change.

Basis of Compensation

An engineer who has handled the acquisition of several undertakings tells us that there is not the slightest difficulty in merging small into large undertakings, and that the amalgamation need not be spread over a long period of time. With the absorption of undertakings the question of compensation looms large, however. The valuation of company undertakings appears comparatively straightforward, but the basis for fixing the compensation to municipalities is not so easy. Presumably it would be felt that a sum exceeding the bare outlay, less depreciation, should be paid, though it must always be borne in mind that the effect of the transaction is after all only the transfer of the industry from one form of public ownership to another and that in any case the costs will ultimately have to be found by the public. It would be very unfair if those undertakings which have spent money in paying off their loan debt or in keeping up to date were placed at a disadvantage. Many undertakings have spent capital in advance of load requirements in far-sighted planning.

These considerations stress the necessity for the industry to make every effort to devise an acceptable scheme of reorganisation and for the Government, if it is going to make changes, to announce them as soon as possible. Immediately the lines on which its future development is going to proceed are made known the industry can be relied upon to do its best.

A.C. Vector Representation

Fundamental Principles Involving the Use of the Operator j

By A. G. Powell, A.M.I.E.E.

IN approaching the subject of alternating current vectors and vector calculations, it is well to consider briefly the fundamentals of the representation of alternating quantities by this means, in which the magnitude of the quantity is indicated by the vector length, and its phase relation by its angle to the reference axis.

The conventional representation by vectors is based on the positive direction of rotation being anti-clockwise, hence angles of lead are measured anti-clockwise and angles of lag, clockwise, from the vector or axis of reference.

Amongst the methods of vector representation are the form $E \angle \pm \phi$ in which the magnitude is coupled with a statement of the phase angle. This, whilst giving the essential

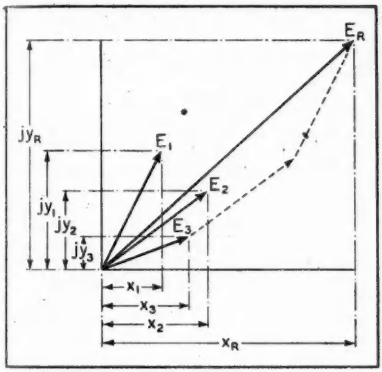


Fig. 1

information, does not lend itself to calculation or other than graphic manipulation. The polar form, *viz.*, $E(\cos\phi + j \sin\phi)$ is trigonometrical, and defines the vector in terms of the cosine and sine values of the phase angle. A method in common use and lending itself to somewhat easier calculation is the rectangular or Cartesian form $E(x \pm jy)$ in which the vector is resolved into its rectangular in-phase and quadrature components, the latter being indicated by the symbol j.

In fig. 1 the three vectors E_1, E_2 and E_3 are represented in this form by :—$E_1 = x_1 + jy_1$, $E_2 = x_2 + jy_2$ and $E_3 = x_3 + jy_3$. The components of the resultant can be obtained by direct addition $E_R = x_1 + x_2 + x_3 + j(y_1 + y_2 + y_3) = x_R + jy_R$.

The magnitude of E_R is $\sqrt{x^2_R + y^2_R}$ and its phase angle is denoted by $\tan \phi = \frac{y}{x}$. It should be noted that in deciding the sign to be applied to ϕ, that is, whether this is leading or lagging, the symbol y must be given the sign applied to jy. So far as the addition and subtraction of vectors is concerned the symbol j, denoting the quadrature component, can be considered as an indication that the associated quantity is measured along the vertical axis although its real significance is deeper and this becomes apparent in the multiplication and division of vector quantities.

Considering in fig. 2 the four quadrants formed by the x and y axes, if components lying along the x axis to the right of the origin are considered positive, then those in the opposite direction, *i.e.*, to the left of the origin, are negative. This rotating of the vector through 180 deg. is therefore equivalent to multiplying it by -1 and it is reasonable to deduce that turning the vector through half this angle, *i.e.*, 90 deg. anti-clockwise is the same as multiplying by $\sqrt{-1}$. This quantity, which is imaginary, is represented by the symbol j. Commencing from the + direction in fig. 1, a vector lying along this axis if multiplied by j will be rotated through 90 deg. anti-clockwise, by -1 (or j^2) through 180 deg. and by $-j$ (or j^3) through 270 deg.

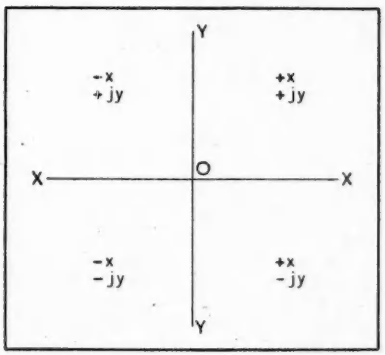


Fig. 2

A vector lying in any of the four quadrants can therefore be defined by giving the appropriate signs to the in-phase and quadrature

components, the actual angle in the quadrant and the magnitude of the vector in effect being defined by the numerical values of these components, and the particular quadrant in which it falls, by the signs allocated to them. The parallel between the in-phase and quadrature components and the cosine and sine values of the phase angle will have been appreciated.

Thus vectors to the right of the y axis have their in-phase or cosine components positive and below this axis negative, and vectors above the x axis have their quadrature or sine components positive, and below it, negative.

This will be made clear by fig. 3 in which the four vectors E_a, E_b, E_c and E_d are defined as follows :—$E_a = x_a + jy_a$, $E_b = -x_b + jy_b$, $E_c = -x_c - jy_c$ and $E_d = x_d - jy_d$.

The necessity of the operation of multiplication and division of vector quantities arises in calculations involving impedances. The conception of an impedance as a vector may be confusing and it may be clearer to regard the vector as that of the voltage drop set up across the impedance by the current flowing in it.

An impedance of resistance R and inductive reactance X is expressed as $Z = R + jX$. As in this case the voltage leads the current flowing, the sign applied to jX is positive. With a capacitive reactance, the current leads the voltage and the quantity jX is negative.

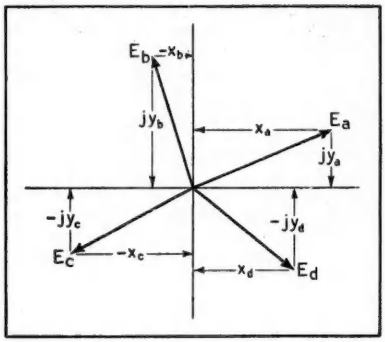


Fig. 3

The reciprocal of the impedance vector is the admittance vector and the combined admittance of a number of parallel circuits is given by the sum of their individual admittances. As the admittance is associated with the current flowing, the signs applied to the reactive term are in the opposite sense to the case of impedances, *i.e.*, for impedance, inductive reactance is positive and capacitive reactance negative. For admittance, inductive reactance is negative and capacitive reactance positive.

The multiplication and division of vectors is carried out in accordance with the ordinary rules of algebra. The product of two vectors is a third vector whose magnitude is their product and its angle is the sum of the angles of the two original vectors, or $(x_1 + jy_1) \times (x_2 + jy_2) = x_1x_2 - y_1y_2 + j(x_1y_2 + x_2y_1)$ which is illustrated in fig. 4. Similarly, the quotient of two vectors is equal to their quotient in

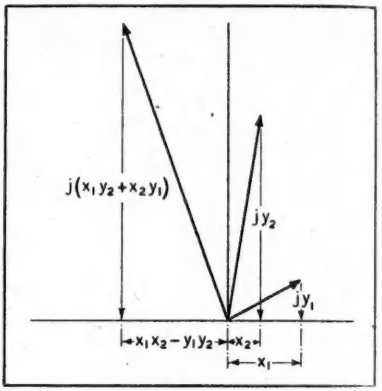


Fig. 4

magnitude and the phase angle is the difference of the angles of the two original vectors.

The identity of j with $\sqrt{-1}$ makes the following ruling obvious:—$j \times j = -1$, $-j \times j = 1$ and $-j \times -j = -1$.

The foregoing illustrates simply the fundamentals; the development to deal with three-phase problems is on the same lines. Thus, in the case of a three-phase system with voltage vectors V_A, V_B and V_C (reading in clockwise order) and assuming the voltages to be equal and of magnitude V, taking V_A as the reference vector, $V_A = V$,

$$V_B = V\left(-\frac{1}{2} - j\frac{\sqrt{3}}{2}\right) \text{ and } V_C = V\left(-\frac{1}{2} + j\frac{\sqrt{3}}{2}\right)$$

New Zealand Load Increase

IN the six months to the end of September last New Zealand supply authorities received 855·4 million kWh from the P.W.D. compared with 815·8 million kWh in the corresponding six months of 1941. The Electricity Controller stated recently that the hydro-electric position was normal except in some parts of the North Island, where the effects of the dry weather were being felt; in the South Island the lakes were at a high level and there had been very little running of steam plants. The system loading showed an increase of 5 per cent. The new 25,000-kW generator installed at Waikaremoana was in running order but had not yet been taken over from the contractors.

Organised Maintenance

The Need for Efficient Planning

By H. Greaves, A.I.I.A.

A BOOK on factory administration which I recently read described the complex organisation necessary to run a factory at the highest degree of efficiency, but out of three hundred pages only two and a half were devoted to the maintenance of plant and only twelve lines to the electrical side. This seems to indicate that, in the author's view, the maintenance of plant was not a matter calling for much organisation and administration. It is a pity that such an impression is allowed to exist, for it is obvious to any far-seeing works manager that production stands or falls by the condition of the plant, especially in a modern factory where individual drive is almost always employed.

True maintenance is not the repair of breakdowns but their prevention. This department of a works is as important as the production side and should be as well organised

The drawing office and the planning, rate-fixing and progress departments are co-ordinated to produce the right amount of goods at the right time and at the right price, and to prevent machines standing idle for lack of work. Yet all this hypothetical output is dependent on the availability of the machines, not only to operate when called upon but to turn out accurate work—a combination which is not always forthcoming, with the result that the percentage of scrap produced is higher than it should be. There is just as much organisation required to keep plant in first-class condition, and in many ways the methods to adopt are similar to those used for planning the output.

Organised maintenance means planned maintenance, and the successful operation of the plan can only be achieved by a progress system. This should be thoroughly understood if the final result is to be a good record of immunity from breakdown.

Co-ordination of Work

The maintenance of plant in the factory should be the prerogative of the plant repairs department, and not split up between electricians, millwrights and, in some cases, the tool room, each with their own stores. With the latter method there are delays through lack of co-ordination, each section blaming the other when things go wrong.

The plant repairs section should be staffed by the highest grade of craftsmen, embracing electricians, one or more winders, a mechanician (for clocks, telephones, public address equipment, etc.), fitters, turners, and other machine men, together with at least one man who is a specialist in hydraulic control—a feature which is highly developed on the modern machine tool. This article is concerned only with the electrical section, but the methods can be adapted to all trades.

Whereas on the production side of the factory inspection does not really begin until the parts come from the machines, in the plant repairs section inspection is the very keystone, and only by a complete understanding of what is required can the scheme give the expected results.

The average electrician cannot, or will not, look upon plant inspection with other than a certain amount of contempt. For some reason best known to himself he feels that his job is to deal with repairs; in fact, I remember one stating that he was only on duty to take care of any breakdowns which occurred. This attitude cannot be tolerated in modern factories, for only by continuous inspection—not merely casual observation—can the weak spots in the plant be located, whether they be in the motor, switchgear or the wiring, in order to take the necessary steps to prevent breakdown. There is no excuse for a man stating that he has nothing to do. If this were proved to be the case, then the department is overstaffed and the remedy is obvious.

Inspection Procedure

There are many methods of inspection, all varying in procedure yet all producing satisfactory results. Conditions are often difficult owing to the hours of work, yet no factory can operate for seven days a week continuously or for twenty-four hours every day; there is always some part of every day, usually at least five hours, when machines can be inspected. In many cases more time is available at week ends. These are the times when all hands should be engaged on examination, testing and making out reports and recommendations for future action.

To simplify matters each man should be responsible for a section of the factory. This creates interest and offers the opportunity for payment by results in the form of efficiency bonus. It is one thing to inaugurate a scheme of this nature and quite another to ensure that it is being carried out regularly and conscientiously. Here again the system calls for similar methods to those adopted by the production departments.

To avoid hold-up of production and stop

bottlenecks, it is usual to have progress chasers. Similarly, in any work of inspection, it is necessary to have men who will keep the job moving. These men may be called section leaders and will be responsible for the co-ordination of all work, inspections and repairs, during the time they are on duty. At the end of their shifts they will submit reports giving details of work carried out so that permanent records can be kept. Such records are of the utmost value to the plant engineer as they enable him to spot the machines which give the most trouble and to take steps to improve matters.

Provided the right type of men are engaged it is not necessary to stand over them to see if they are carrying out their duties in a conscientious manner. Generally speaking, I have found that the men can be trusted to give a square deal; on the other hand, the job must not be allowed to develop any sort of slackness, hence the need for co-ordination.

It is most important that inspection should not be merely casual observation. Certain points suggest themselves as calling for examination, such as contacts, bearings, brushes, contactor coils, remote-control buttons and solenoids. Any minor faults should be put right on the spot. Where time does not permit a major repair, then the machine should be taken out of production by arrangement with the superintendent concerned.

I have included bearings in the list. In some factories bearing renewal may be carried out by the tool room or millwrights. This is not a wise policy, as many a motor winding is damaged due to the ignorance of a fitter in renewing the bearings. Furthermore, if the work is done by the electrical department the question of responsibility for the future performance of the motor is settled once and for all, especially if lubrication is controlled by the same department.

The importance of keeping plant in running order is recognised today; yet it will be no less important when things return to normal, for it will be a matter of keeping down overhead costs to the minimum in order that we may continue to export manufactured goods.

Imports of Trinidad

Substantial Increase in 1941

THE accompanying statistics of electrical imports into Trinidad in 1941 have been extracted from the recently published official returns of the colony, comparisons with 1940 being added. It will be seen that imports of electrical machinery were more than trebled and those of other electrical goods and apparatus increased by more than 50 per cent. The only noteworthy decrease was in telephone material other than radio. Most of the additional trade went to the United States.

The outlook in the colony is obscured by the cloud that overhangs the sugar industry. Labour shortage, through diversion of workers to the defence bases, is the present trouble, and another decline in yield is forecast. To what extent the production of petroleum products has compensated for the depression in the sugar industry cannot be stated, as output figures are withheld. The prosperity of the oilfields has increased the demand for goods. Electricity has been rationed for some time.

Description of Goods	1941 Thousand $	Inc./dec. on 1940 $
Insulated elec. wires and cables—		
Total	213	+ 25
From United Kingdom	123	− 36
„ United States	44	+ 24
„ Canada	46	+ 38
Primary batteries—		
Total	28	—
From United Kingdom	4	− 8
„ United States	2	− 3
„ Canada	22	+ 11
Accumulators and parts—		
Total	38	+ 7
From Canada	36	+ 13
Electric stoves—		
Total	33	+ 7
From United Kingdom	4	− 11
„ Canada	28	+ 18
Electric refrigerators—		
Total	80	+ 2
From United Kingdom	2	− 19
„ United States	7	− 25
„ Canada	71	+ 46
Ditto, parts—		
Total (mainly U.S.A.)	29	+ 21
Electrical goods and apparatus, n.o.p.—		
Total	341	+ 120
From United Kingdom	101	− 3
„ United States	167	+ 94
„ Canada	71	+ 29

Description of Goods	1941 Thousand $	Inc./dec. on 1940 $
Electrical machinery—		
Total	688	+ 474
From United Kingdom	155	+ 36
„ United States	493	+ 431
„ Canada	38	+ 28
Wireless apparatus—		
Total	116	+ 41
From United Kingdom	69	+ 30
„ Canada	23	+ 20
„ United States	24	− 7
Other telegraph and telephone apparatus—		
Total	81	− 31
From United Kingdom	72	− 32
„ United States	8	+ 4
Electric lamps under 20 V—		
Total	15	+ 4
From United Kingdom	4	− 2
„ Canada	6	+ 5
„ United States	5	+ 2
Ditto, 20 V *and over—*		
Total	44	+ 5
From United Kingdom	36	+ 1
„ Canada	6	+ 6
Other lighting appliances—		
Total	35	+ 13
From United Kingdom	14	—
„ Canada	9	+ 8
„ United States	7	+ 2

PERSONAL and SOCIAL

News of Men and Women of the Industry

IT is announced that the retirement of **Mr. D. A. Bremner, O.B.E., M.I.E.E.**, from the directorship of the British Engineers' Association will take effect at the end of April and that Mr. **A. W. Berry**, A.M.I.E.E. (Crompton Parkinson, Ltd.), has been appointed to succeed him. Mr. Bremner has been director of the B.E.A. for

Mr. D. A. Bremner

Mr. A. W. Berry

about twenty-four years. It will be recalled that at the end of last year, plans for closer co-operation between the Association and B.E.A.M.A. were announced.

Mr. J. MacFarlane, the secretary of the Radio Wholesalers' Federation, has retired from that position after fifteen years' service, and is succeeded by **Mr. C. Horton,** who for twenty-two years was one of the assistant secretaries of the Society of Motor Manufacturers and Traders, Ltd. Mr. MacFarlane became secretary of the Federation upon its formation in 1928, and as the result of his work many of the early troubles, common in any new trade, were quickly overcome and there followed a long period of successful co-operation with other radio trade associations, together with working agreements with manufacturers. Mr. MacFarlane has had a varied business career, most of it in the journalistic world.

Mr. T. H. Carr, the deputy city electrical engineer and manager at Bradford, has been recommended for the position of city electrical engineer and manager rendered vacant by the death of Mr. W. Dundas.

Clitheroe Town Council has accepted a D.J.B. recommendation to grade **Mr. J. Batty** as mains superintendent and **Mr. G. Braithwaite** as meter superintendent. The Council at its last meeting supported a letter from Derby Corporation expressing the opinion that the salaries of chief electrical engineers provided by agreement are too high and asking local authorities to send a protest to the National Joint Committee.

Mr. J. Philp, C.A., director and secretary of the Consolidated Pneumatic Tool Co., Ltd., for the last twenty-four years, has retired. Mr. Philp was for a number of years in the New York Office of Price Waterhouse & Co., but returned to England in 1916 to take up an appointment with the Ministry of Munitions. In 1919 he was appointed secretary of the Consolidated Pneumatic Tool Co., and in the following year was elected to the board. He is succeeded as secretary by **Mr. N. Readman,** A.C.A., who was for a number of years a manager of the Paris office of Price Waterhouse & Co.

As a result of the entrance scholarships held at Faraday House Electrical Engineering College on April 6th, 7th and 8th, the following awards have been made :—**Mr. J. S. Hawkes** (Haberdashers' School, Hampstead) "Faraday" scholarship of 80 guineas a year for two years; **Mr. K. G. King** (Framlingham College) "Maxwell" scholarship of 60 guineas a year for two years.

Mr. A. Hale has been nominated president of the South Wales Branch of the Association of Mining Electrical and Mechanical Engineers. **Mr. W. H. Littlewood** has been elected president of the Yorkshire (South-Eastern) Branch and **Mr. T. H. Williams** president of the Stoke-on-Trent Sub-Branch of the Association.

Mr. P. J. Waldram celebrates this year the fiftieth anniversary of his election as chairman of the Junior Institution of Engineers and to mark the occasion the Council has elected him a vice-president.

Sir Lawrence Bragg, Cavendish Professor of Experimental Physics, Cambridge, is visiting Sweden for the purpose of giving a series of lectures under the auspices of the British Council.

Mr. H. Pryce-Jones, formerly deputy city electrical engineer, Liverpool Corporation, and now engineer and manager of the Brighton Corporation Electricity Department, has been elected president of the Liverpool Engineering Society in succession to **Prof. R. G. Batson.**

Brig.-General R. F. Legge, C.B.E., D.S.O., Comp.I.E.E., a director of the British Electric Power and Light Corporation, Ltd., and associated companies, has been elected president of the Incorporated Association of Electric Power Companies, in succession to **Lt.-Colonel S. E. Monkhouse,** M.I.E.E. **Major H. Richardson,** M.C., J.P., M.I.E.E., chairman and managing director of the Metropolitan Electric Supply Co., Ltd., and **Mr. W. J. H. Wood,** M.I.E.E., M.I.Mech.E., a director and engineer-in-chief of the County of London Electric Supply Co., Ltd., have been elected vice-presidents.

Brig.-Gen. R. F. Legge

Mr. F. W. Money, manager of the Estimating Department at the head office of the General Electric Co., Ltd., retired at the end of March after forty-nine years' service with the company. He will be succeeded by **Mr. H. E. Carmody** from the Sales Department.

Mr. Money joined the G.E.C. in 1894 as

counter assistant dealing with electric lighting supplies. He subsequently had experience in a number of other departments, and also served for some time as private secretary to the late Lord Hirst, who appointed him manager of the Estimating Department, which position he held for over thirty years.

Mr. Carmody has already had an extensive and varied experience in the G.E.C. He joined the company in 1917 as a commercial apprentice, but his business career was interrupted in the following year when he joined the Army, in which he served until 1920. On returning to the company he was sent to the Newcastle branch as assistant accountant, remaining there for three years before returning to head office. For the next fifteen years he served successively in the Share Department, Counters, Estimating Department and Sales Department, and in 1938 was transferred to the Southampton branch as assistant manager. He returned from Southampton last year to take up a responsible position in the Sales Department.

Dr. Joseph Slepian, associate director of research, Westinghouse Electric & Manufacturing Co., has been awarded the 1942 Lamme Medal of the American I.E.E. for his contributions to the development of circuit-interrupting and current-rectifying apparatus.

The *Electrical World* says that Dr. Slepian has specialised particularly in the development of electrical apparatus involving arc phenomena and has made some of his major contributions in connection with the development of auto-valve lightning arrestors, de-ion circuit-breakers, high-voltage fuses, ignitrons and mercury-arc rectifiers.

Former colleagues in this country of **Mr. S. R. Tombat,** B.A., B.Sc.Tech.(Manchester), will be interested to learn of his appointment (reported in the *Indian Textile Journal*) as general manager of the Mysore Spinning & Manufacturing Co., Ltd., and Minerva Mills, Bangalore. After gaining first place in Madras Presidency for physics and winning the Arni gold medal Mr. Tombat secured a Government of India technical scholarship and came to this country in 1912 for training in electrical engineering. He secured the B.Sc.Tech. degree with honours in 1915 at Manchester University and spent two years in the electrical department of Mather & Platt, Ltd., with a further eighteen months as a pupil in the Manchester Corporation Electricity Department. He returned to India in 1912 and was for a time an assistant with the Crompton Engineering Co., Ltd., Madras, joining his present company in 1921 and becoming deputy general manager in 1926.

Obituary

Lieut.-Commander F. K. Moss.—The death occurred recently of Lieut.-Commander Frank K. Moss, who was for twenty years in the lighting research laboratory of the American General Electric Co. He was well known in this country as the collaborator with Dr. M. Luckiesh in the study of the effects of lighting upon the human system which developed into the " science of seeing." He was forty-four years of age.

Major W. J. A. Murray.—We regret to learn of the death on active service in North Africa of Major William J. A. Murray, R.E., Indian Army, son of the burgh electrical engineer of Stirling, Mr. W. R. Murray. Major Murray was with the Cawnpore Electric Supply Corporation, Ltd., for seven years. Before going to India he was with the Grampian Electricity Supply Co. at Tummel Bridge.

Mrs. M. M. Williams.—We regret to record the death, which occurred on March 29th, of Mrs. Mary M. Williams, M.A., wife of Mr. O. D. Williams, A.M.I.E.E., M.A.Min.E.E., of 27, Malvern Avenue, Rugby.

Will.—The Earl of Midleton, chairman of the Globe Telegraph & Trust Co., deputy-governor of Cable & Wireless (Holding), Ltd., and a director of other companies, left settled property now valued at £68,590, making a total of £124,212 passing at his decease.

The Hydrogen Engine

THE use of hydrogen on the Erren principle as engine fuel for the propulsion of U-boats during submersion is discussed by Mr. A. Regnauld in the *Faraday House Journal*. The main Diesel engine when operated by fuel oil on the surface drives a small dynamo, which supplies current to an electrolyser in which water is broken down into hydrogen and oxygen at a pressure from 3,000 to 5,000 lb. per sq. in. The gases are stored in cylinders, which are said to occupy considerably less space and to weigh much less than the usual storage batteries, which also have the disadvantage of forming chlorine gas should sea water enter the hull.

When the engine is changed over to hydrogen, the closed-exhaust system is used. Steam produced by the combustion of hydrogen and oxygen presses out of the cylinder on completion of the working stroke and is ultimately returned to the cylinder at a temperature slightly above the saturation point. A mixture of hydrogen and oxygen is injected into the cylinder, where it is ignited by a spark. The combination of the two gases forms more steam which, together with the steam already in the cylinder, is superheated by the heat liberated as a result of the combustion and which, as it expands, drives the piston. For small submarines, the electrolyser can be omitted and the requisite quantity of gas carried in cylinders charged aboard the parent ship or at the shore bases.

Developments during the war, Mr. Regnauld considers, may lead to wider employment of the hydrogen engine in the future (*e.g.*, for transport) as an economical method of utilising off-peak energy, more particularly in view of the probably greater demand for oxygen for welding.

I.E.E. Scottish Centre

AN increased membership was reported at the annual general meeting of the Scottish Centre of the Institution of Electrical Engineers on April 15th at the Heriot-Watt College, Edinburgh. The following officers were elected for the 1943-44 session:—Chairman, Mr. D. W. Low, B.Sc.; vice-chairmen, Col. H. Carter, B.Sc., T.D., and Mr. J. Eccles, B.Sc.; hon. secretary, Mr. R. B. Mitchell; and assistant hon. secretary, Mr. H. V. Henniker. A paper by Mr. J. W. Leach on " Standardisation of Distribution in Densely Loaded Areas " was submitted, but the author was not able to be present.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Circuit Calculations

IN the interesting article on this subject published on p. 449 of the *Electrical Review* of April 2nd, 1943, the author gives in his fig. 5 what he describes as a very simple method of obtaining the vectors of the

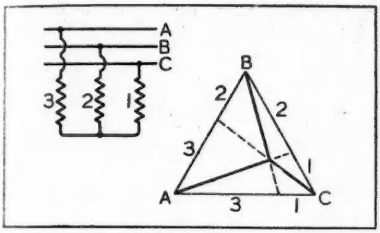


Diagram A

voltage drops in three unequal resistances that are star-connected to a balanced three-phase source of supply. His method is, however, unnecessarily complicated. It is only necessary to divide each side of the voltage triangle in the ratio of the resistances connected to the corresponding lines and join the points to the opposite corners.

This is shown in the diagram A for resistances in the ratio of 1 : 2 : 3. It is only really necessary to divide two of the sides. The three vectors thus obtained give the voltages across the resistances in their proper phase relation. This is fairly obvious from Thévenin's theorem.

The same applies to his fig. 6. Diagram B is drawn for the case in which $R_1 = 3$, $R_3 = 1$ and $Z = 2 \angle 45°$ in any suitable units. The side AB is divided at E in the ratio of 3 : 2 just as if Z were a resistance, and the point O_1 is found as before. The actual star point O is then found in the way described by the author of the article.

Towards the end of the article he says, "A circle is drawn through B and D so that the segment *to the left* of BD contains an angle equal to θ." Then he says, "The construction of fig. 5 [presumably a misprint for fig. 6] applies to an inductive impedance connected to B phase; if the impedance is capacitative, the segment of the circle containing the phase angle θ will be drawn *to the left* of BD." Should this not be "to the right"?

Glasgow. G. W. O. HOWE.

Re-organisation Proposals

I SHOULD like to take the opportunity of congratulating you upon the inauguration, in your issue of April 16th, of discussions on this important subject. Certainly I, and probably all your readers, will follow the development of the discussion with the closest interest.

In your issue of April 16th, on page 508, under the heading "Divided Counsels," you refer to the action of my Authority in recently submitting its proposals for the London and Home Counties Electricity District to the Government, and to all constituent members of the Authority. You also refer to the resolution passed on February 9th last by the Conference of Joint Electricity Authorities and Joint Boards, of which my Authority is a member. Perhaps you will allow me to correct the impression that these proceedings are illustrations of divided counsels.

The facts are that both the Conference of Joint Electricity Authorities and Joint Boards and my own Authority deferred putting forward their views so long as there appeared any hope of the Joint Committee of Electricity

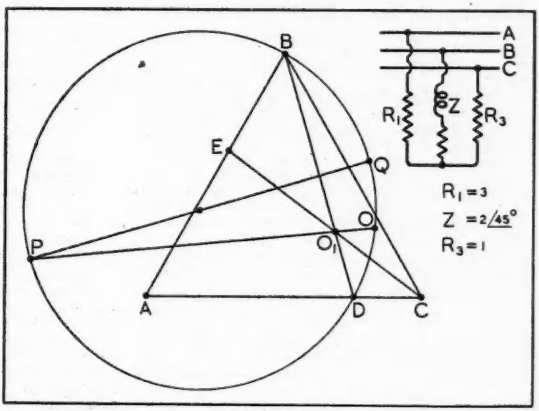


Diagram B

Supply Associations, to which also you refer, submitting agreed proposals within a reasonable time. That Joint Committee, contrary

to what you say, has declined to proceed with the preparation of any report. In June, 1942, after Lord Portal's speech in the House of Lords, the Minister of Fuel and Power, through the Electricity Commissioners, invited the Joint Committee to submit its views on the points raised in the House of Lords and on other allied questions concerning the future of the industry. After some months' consideration, that Committee, in December, 1942, declined to proceed with the formulation of any views, and suggested the formation of still another joint committee, representing the various electricity supply associations, to consider the matter.

That further joint committee has not yet, so far as I know, been established. It certainly was not established on the date of your issue—April 16th. It was in these circumstances that the Conference of Joint Electricity Authorities and Joint Boards felt that there was no longer any reason why they should not publicly express their views. For the same reason, my own Authority felt that it should proceed with the preparation of a memorandum expressing its views upon the particular problems of the London and Home Counties Electricity District, for which it is the District Authority.

I may add that, as chairman and member of this Authority, I have for years past endeavoured to get joint consideration of these common problems, so far without very much success. Therefore, I hope that your efforts in this direction and your discussion of the problems will be not only comprehensive but successful.

London, W.C.2. DUDLEY STUART,
Chairman,
London & Home Counties J.E.A.

Faraday House to Admit Women

YOU have been very helpful in the past in mentioning this College in the pages of your paper, so that I take the liberty of bringing to your notice another milestone in its history. The Board of Governors has decided to open the College to women students at the September term.

There are already women electrical engineers, and a few women members of the Institution of Electrical Engineers. There is also a Women's Engineering Society.

London, W.C.1. W. R. C. COODE-ADAMS,
Principal,
Faraday House Electrical
Engineering College

PARLIAMENTARY NEWS

Domestic Meter Costs

IN the House of Commons on April 20th, Capt. Crowder asked the Minister of Fuel and Power what was the average cost of the electricity meter supplied to small domestic consumers and the average quarterly rent charged therefor; and whether, for the purpose of this information, he would take the statistics of six of the leading electricity companies.

Major Lloyd George said the present average cost of a 10-A ordinary (non-prepayment) electricity meter was £1 19s. The practice of electricity undertakings in charging meter rents varied considerably. Some made no charge at all, and recovered the cost of the meter, its installation, etc., in their other revenues. Some charged a separate meter rent of anything up to 3s. a quarter, which appeared to be the maximum. Generally, where the charge was made it was intended to cover some or all of the general costs of the undertaking in connection with the meter, *e.g.*, the costs of fixing, reading, maintenance and renewal. Consumers who paid for their supply on an all-in or two-part tariff were not normally charged any meter rent.

Coal Stocks

On April 21st, Mr. Foster asked the Minister of Fuel and Power whether he would state the total quantity of coal produced and the quantity consumed in the nine months ended March 30th, 1943; the quantity in stock on that date; and the comparable figures for the corresponding period of 1941-42.

Major Lloyd George said that the total production of coal in the nine months ended March 30th, 1943, was 155,792,000 tons, compared with 156,233,000 tons in the same period of 1941-42, a difference of about 400,000 tons. It would not be in the public interest to give figures of inland requirements and foreign shipments separately, but the total of inland consumption plus overseas shipments, was 152,413,000 tons in the nine months, against 156,543,000 tons in the corresponding period of 1942. He did not consider it advisable to give in public the figures of stocks held at different dates, but, thanks to the efforts which had been made and the exceptionally mild weather of the first two months of the year, the stock position was easier than it was this time last year.

Control of Business Premises

Mr. Bowles asked the President of the Board of Trade whether he would state the reason for the extension of the Location of Industry Order to cover premises below 3,000 sq. ft. in area.

Mr. Dalton replied that under the Location of Industry (Restriction) Order, 1941, the starting up of any form of production in premises of 3,000 sq. ft. or over in area, or a change-over in the type of production carried on in such premises, was subject to the issue of a licence by the Board of Trade. With the progress of the war it became essential to cover all premises, whatever their size, so that there should be no waste anywhere of our resources, whether of space, raw material or labour. Accordingly, following consultation with the Ministry of Production, an Order was made in October last abolishing the exemption of premises below 3,000 sq. ft. in area and thus bringing within the Department's control all premises, whatever their area. The Order was administered in close consultation with the Regional Boards of the Ministry of Production. The Order also governed the use of premises for storage purposes.

B.E.A.M.A. Annual Meeting

Wartime Work and Post-War Preparations

THE report for 1942 of the British Electrical and Allied Manufacturers' Association was summarised in the *Electrical Review* of April 16th. It was presented at the annual meeting on April 15th, by Mr. L. W. Smith, chairman of the Council, who paid tributes to those connected with the Association who had died since the last meeting, including three vice-presidents—Lord Hirst, Mr. Max Railing and Mr. E. S. New; and Messrs. J. L. Wilson and W. O. Smith, Capt. C. J. Scott, Mr. C. Proctor Banham and Mr. F. Broadbent. Mr. Smith also congratulated Sir George Nelson on his knighthood and election as president of the F.B.I., and referred to the election of Dr. A. H. Railing, Mr. J. A. Hirst and Mr. A. Berkeley as vice-presidents of the Association.

Proceeding, he said that although it had become rather a hackneyed statement, it was none the less true that this was an engineers' war. As they had contributed during the war so they would expect to have a fair share in the voice of reconstruction in the days of peace. The Council had not been unmindful of this fact, and they realised that only through a united engineering industry could such an object be achieved. Various bodies, persons and groups of individuals had issued manifestos and reports advocating the formation of some new super association for dealing with this aspect of the case. The Council had taken the view all along that machinery already existed for that purpose and only required adapting and co-ordinating to achieve the desired end.

Co-operation with the B.E.A.

As a first step in this direction the Council had come to an agreement with the British Engineers' Association, the largest association dealing with the mechanical side of industry, to examine the possibilities of closer co-operation. It was not considered that the time was yet ripe for complete fusion, but it was clear that, whilst still retaining liberty of action as regards their own domestic problems within the electrical industry, there were many problems of post-war reconstruction which were common to the engineering industry as a whole and on which they could speak with one voice.

During the year agreement was reached with the Ministry of Supply for the standardisation of prices for certain classes of motors. Advantage was taken of the liaison between the various Government Departments to clarify and amend certain of their conditions of contract which appeared to be unsatisfactory from the contractors' point of view. In particular, a default clause which gave the Government Departments the absolute right to determine a contract without notice, was modified.

During the year an arrangement was reached with the Customs and Excise authorities which confirmed the tentative arrangement previously reached for a simplified calculation of purchase tax, based on a standard discount of 25 per cent., which had been accepted by the Customs and Excise authorities as a standard notional discount for calculations for purchase tax on electrical goods.

Discussions were started at the end of 1942 with the Central Price Regulation Committee to standardise the terms upon which any Maximum Price Order relating to electrical goods might be made. In a number of other directions the Association had been consulted by, and he thought they had been of assistance to, the various Government Departments, in connection with the many Orders which had come into force during the year.

Exports after the War

While the necessity for encouraging export trade during the war period had somewhat diminished, the two Export Committees had continued in being, and there had been many discussions with the Board of Trade concerning the importance of the export trade in the building up of a prosperous industry in the post-war period. The chairmen of the two Committees (the Director and the Deputy-Director) had constantly kept this point of view before the Board of Trade. Cordial relations had been continued with the President of the Board of Trade, and with the various permanent officials with whom the B.E.A.M.A. was constantly in contact.

The simplified scheme arranged with the War Damage Commission in 1941, referred to at the last annual meeting, was continuing to work smoothly although, in order to simplify matters further, during the year an arrangement was reached whereby members were recommended to adopt a clause in their conditions of sale which had the effect of vesting the property in the goods in the purchaser immediately those goods were delivered to site, the result being that generally speaking the contractor divested himself of the liability for insurance against war damage after the goods had been delivered to the purchaser's site.

Recently they had a very important conference on the subject of post-war reconstruction with the Board of Trade—Sir William Palmer's Committee—at which the Director and members of the delegation were able to

put forward fully their views on this very important subject as they affected the electrical industry. His impression was that they were very well received and that their various points were fully appreciated by the members of the Board of Trade Committee. At the end of the meeting the members of the Committee said they hoped it would not be the last conference with them.

During the year the standard B.E.A.M.A. formulæ for calculating variations in prices due to fluctuations in the rates of wages and the costs of materials were agreed with the electricity supply undertakings, and these revised formulæ were now in general use and had received considerable publicity in the electrical Press.

During the year three new Sections were formed, and the Insulations, Accessories, and Heating, Cooking and Domestic Appliances Sections, which were becoming large and cumbrous, had been divided—the Insulations Section into seven sub-sections, and the Accessories, and Heating, Cooking and Domestic Appliances Sections into eight.

During the year the Commercial Electric Refrigeration Association was formed under the auspices of the B.E.A.M.A. It represented something of a new departure in the activities of Associations connected with the B.E.A.M.A., in that C.E.R.A. (as it is known) combined in its membership the manufacturers of refrigerating machinery and heat insulating materials, and also the distributors and service agents throughout the country. It was hoped that this wide field of co-operation would help to give adequate servicing facilities under the difficult wartime conditions, and would evolve into an organisation for the thorough development of this branch of the industry, which clearly would expand rapidly after the war.

Dealing with wartime specifications and substitute materials, the chairman said that the work of the Technical Committees and of the B.E.A.M.A. representatives on B.S.I. Committees had continued throughout the year. The most important specifications with which they had been concerned were: War Emergency Amendment to the Transformer Specifications; War Emergency Specification for Arc Welding Plant for Heavy Construction Work; War Emergency Specification for Alternators and D.C. Generators (Internal Combustion Driven); and one for Wartime Finish of Machinery and Plant.

He thought that members would agree that B.E.A.M.A. was maintaining its position as a body well founded, well and efficiently run, and one which the Government felt it could consult as being truly representative of the electrical manufacturing industry. He concluded with a tribute to the staff for their loyal and untiring efforts.

The chairman then announced that as the result of the ballot the following six members of the Association were elected members of the Council for the Session 1943–4:—British Thomson-Houston Co., Ltd., General Electric Co., Ltd., W. H. Allen Sons & Co., Ltd., C. A. Parsons & Co., Ltd., Berry's Electric Ltd., and Mather & Platt, Ltd. As we have already reported, Mr. P. S. Turner (director, Metropolitan-Vickers Electrical Co., Ltd.) and Mr. L. W. Smith (managing director, Elliott Bros. (London) Ltd.) have been elected chairman and vice-chairman of the Council.

Right to Sue Crown

B.T.H. Co. Succeeds Against Minister

THE Court of Appeal decided on April 19th that the British Thomson-Houston Co., Ltd., had the right, in an action brought against it by the Minister of Supply for damages for alleged breach of contract, to put in a counterclaim, and that it was not to be restricted, as the Minister contended, to the remedy of Petition of Right.

A King's Bench Master, on the application of the Minister, had ordered the counterclaim to be struck out. The company appealed and the Lord Chief Justice (Lord Caldecote) held that the Master was wrong, and ordered the counterclaim to be restored. In the action the Minister is claiming damages, alleging breach of contract in connection with the supply of a quantity of mica. The amount in dispute was said to be some £2,000, and the company's counterclaim is for £68 12s.

Giving judgment in the appeal of the Minister from the order of the Lord Chief Justice, Lord Justice MacKinnon observed that the Minister, possessing all the rights, privileges and prerogatives of the Crown, claimed that he could not be sued in contract, to which the defendants replied that if that was the law, then he could not sue, either. Therefore if the counterclaim was struck out so also must be the claim. On the other hand, if the statute, the War Department Stores Act, 1867 (which was the Act relied on), gave the Minister the right to sue, then it gave the right to counterclaim. That, said his Lordship, was right, in his opinion, and the appeal must be dismissed.

Lord Justice Goddard said no doubt the question was one of considerable importance to the Minister, but this was the first time, he thought, that the Court had been asked to decide that a Minister of the Crown was entitled to sue, while at the same time remaining immune from being sued. The Minister appeared to be reserving to himself the right to litigate at the public expense and to put the subject to the maximum of inconvenience and expense, while the subject was to be deterred from bringing a claim against the Crown. He agreed that the appeal should be dismissed.

The Master of the Rolls also agreed, and said the appeal would be dismissed with costs in that Court and in the Court below.

COMMERCE and INDUSTRY

New Canteen Order. Royalty-free Cables

A Gainsborough Engineer's Grading

THE National Arbitration Tribunal has issued its award (No. 333) in a dispute reported to the Minister of Labour by the Electrical Power Engineers' Association and referred by the Ministry to the Tribunal. The matter in dispute was the salary of an employee of the Gainsborough U.D.C. electricity undertaking. The Council claimed that he should be paid the salary applicable to Grade 6, Class C, of the N.J.B. Schedule, but the E.P.E.A. maintained that the correct salary was that applicable to Grade 4 ("Mains superintendent without charge of sub-stations"). The Association's contention was upheld by the District and National Joint Boards and the Arbitration Tribunal finds in favour of the employee and awards accordingly, the award to have effect as from July 16th, 1942.

Chiefs' Salaries in Scotland

Dundee Corporation Electricity Committee at its last meeting decided to send representatives to a proposed conference to consider the formation of a Scottish District Committee of the National and District Joint Committees of Local Authorities and Chief Electrical Engineers.

Mica Control

The control of mica will in future be exercised by a special section of the Non-Ferrous Metals Control, under Mr. G. F. A. Burgess as Controller. All communications relating to requirements of mica should be addressed to the Mica Control, South Wing, Somerset House, London, W.C.2.

Factory Canteens

The Minister of Labour and National Service has made a new Order entitled the Factories (Canteens) Order, 1943, which amends the Order made in November, 1940. Under the new Order the Chief Inspector of Factories, acting on the Minister's behalf, can direct that the occupier of any factory employing more than 250 employees and engaged on essential work must provide a factory canteen (the previous Order only applied to factories engaged on munitions or any work on behalf of the Crown). A new procedure is also provided for intervening if the service actually provided in any such canteen is unsatisfactory.

G.E.C. Dramatic Society

The G.E.C. Dramatic Society recently presented "Goodness, How Sad!" This amusing comedy by Robert Morley introduces many pleasant characterisations which give the members of the cast of seven every chance to display their talents, and G.E.C. stalwarts and the new members alike gave excellent performances. Back stage, great credit was due to Mr. W. Peacock who directed the show and to Mr. L. A. Foster, who was responsible for the setting and stage management. Financial success, as announced by the chairman of the Society (Mr. Charles F. A. Dobson), was assured right from the start and just over £170 will be given to a fund organised by the Hon. Mrs. Gamage to provide ciné projectors and films for troops stationed in remote places; this time the donation is specifically for the benefit of men in the Faröe Islands.

American Cable Company's Offer

It is reported by the *Electrical World* that the General Cable Corporation has offered the United States Government for the duration of the war a royalty-free licence under all its patents (about 200) covering types of wires and cables vital to the prosecution of the war.

The president of the company, Mr. D. R. G. Palmer, said that upon acceptance of the offer the company would notify all its licensees that they need no longer continue royalty payments provided the Government was given the full financial benefit of the saving to the manufacturers.

Geared Motors

Between 75 and 80 per cent. of all electric motors in the United States are, according to the *General Electric Review* connected to their loads by some kind of speed-reduction transmission. A geared motor is one of the most economical forms of mechanical transmission up to about 100 HP, especially for speed reductions of more than three to one, but whereas motors can withstand momentary overloads of 200 per cent. and over, gears may suffer permanent injury due to abnormal stresses in the teeth at loads in excess of normal rating. Gearing must therefore be more carefully related than a motor to maximum load and account must be taken of flywheel effects (WR^2) that may release large amounts of kinetic energy on sudden decrease of speed.

Mineral Production in Rhodesia

At the annual meeting of the Southern Rhodesia Chamber of Mines held at Salisbury on April 20th, the president, Major E. Tulloch, stated that mineral production in 1942 was the highest in the colony's history, with a total value of £9,377,166, of which gold represented £6,384,255, base minerals £2,976,848, and silver £16,063. In view of continued activity in prospecting for base minerals, there was a distinct possibility of the £3,000,000 mark being reached this year. While unable to give figures, he said that 22 different minerals were being produced and asbestos, coal, tungsten, chrome and mica were chiefly responsible for the increase.

Diesel-electric Ferry

The *Governor Cornwallis*, a new ferry plying between Halifax and Dartmouth, Nova Scotia, is stated to be the first in Canadian waters to be equipped with multiple generating sets for propulsion, the low head room making it impossible to use one large generator.

Details of the ship given in *Electrical News & Engineering* (Toronto) show that the propulsion equipment proper consists of two 500-HP, 350-RPM, 500-V drip-proof shunt-wound motors

directly connected to the propeller shaft, one at each end. Energy for the motors is supplied by four 100-kW, 900-RPM, 125-V shunt-wound separately-excited marine type DC generators directly connected to Caterpillar type oil engines. For excitation and auxiliaries there are two 30-kW, 1,200-RPM, 125-V Diesel-electric sets. The electrical equipment was manufactured by the Canadian General Electric Co. The ferry is specially designed to carry twice the usual number of motor-cars, in addition to 300 passengers.

King's College Re-opening

It is announced that King's College, London University, is to re-open for the Michaelmas term and that the faculties now at Bristol, including engineering, will return to London. It is not proposed to resume evening classes at the College.

Commercial Travellers' Benevolent Institution

The half-yearly Court of Governors of the Commercial Travellers' Benevolent Institution will be held at 4b, Frederick's Place, London, E.C.2, on Saturday, June 26th, at noon.

Kettle Elements

Bulpitt & Sons, Ltd., inform us that they are still producing spare standard elements with a safety device, for their " Swan Brand " electric kettles. There appears to be a misapprehension in certain quarters that there are restrictions on the purchase of kettle elements and that orders must be covered by evidence of essential demand. This is not the case, although, of course, there is a restriction on supplies of electric kettles.

Scottish Trade with Poland

The development of trade between Scotland and Poland after the war will be studied by an Advisory Committee formed within the Scottish-Polish Society which will hold its inaugural meeting in Edinburgh on May 1st. Among the Scottish representatives appointed are Mr. J. B. Mavor, of Mavor & Coulson, Ltd.

Bathroom Fatality

The danger of amateur electrical work and of using radiators in unsuitable places was once again stressed by a coroner at an inquest recently, the victim in this case being a thirty-year-old married woman, Mrs. Naomi Osborn, of Sunnyside, Rotherham. It was stated that she was found lying in a bath holding an electric radiator which was off the floor. There was no water in the bath.

Mr. H. J. Dean, an electrical engineer, said that additional switches had been fitted in two bedrooms by an unskilled person, creating a definite fire risk. The radiator, which was light and flimsy, did not bear a manufacturer's name, and the flex had been extended, the joint being insulated with surgical tape and cotton wool. One of the joints in the radiator flex had made contact with the metal case and this was the primary cause of the accident. There was no provision on the radiator for earthing, and no insulation for the handle.

The coroner, recording a verdict of " Death from misadventure," said that a great responsibility rested on the unknown person who had made the alterations. He also referred to the remarkable presence of mind of the six-year-old daughter of deceased in switching off the electricity before touching her mother, so avoiding injury to herself. It was stated that the girl ran to a neighbour saying " Will you come to my mummy. I think she has electrocuted herself. I have turned the power off."

Grain Size in Tin Alloys

The effect of grain size on the physical properties of metals has been studied by various research workers. Interesting light on the part played by grain size in the properties of pure tin and tin-rich alloys is given in the Tin Research Institute's publication No. 118, which is a reprint of a paper by Dr. W. T. Pell-Walpole in the *Journal* of the Institute of Metals.

Copies of this publication may be obtained free of charge from the Tin Research Institute, Fraser Road, Greenford, Middlesex.

Electric Dock Cranes

The *Journal of Commerce* (Liverpool) reports that the Mersey Docks and Harbour Board is considering the provision of four 6-ton electric quayside cranes for use at the Liverpool and Birkenhead docks. The cost, including erection, is estimated at £28,700.

Change of Address

Drake & Gorham, Ltd., inform us that from May 1st their Bristol office address will be 2 & 4 Church Street, Temple, Bristol, 1.

Change of Name

Rubery Owen Messier, Ltd., have changed their name to Messier Aircraft Equipment, Ltd. The board of directors and management remain unchanged.

TRADE MARK APPLICATIONS

THE following application has been made for a British trade mark. Objections may be entered within a month from April 21st:—

RENEX. No. 622,338, Class 9. Insulated cables.—Scottish Cables, Ltd., Deanside, Renfrew.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following—

TRIUMPH fuse bridge.
Crown Switchgear Co.

Chief Engineers' Salaries

Association's Report and a Rejoinder

IN a somewhat lengthy report the General Purposes Committee of the Association of Municipal Corporations recently dealt with the subject of the salaries of chief electrical engineers of municipal authorites. The report, which was adopted by the Council of the Association on March 18th, reviews the history of the negotiations which followed the introduction of the "Walker Scale" in 1921, a scale which was based solely upon the number of units sold—whether by retail or in bulk.

It recalls that the scale was agreed to by the Incorporated Municipal Electrical Association and the Associated Municipal Electrical Engineers and that there was an agreement, or understanding, that a joint committee should be set up to deal with questions of conditions and remuneration. For some years this was not implemented, but in 1937 the A.M.E.E. issued a memorandum upon the desirability of setting up a joint board.

Subsequently provision was made in a document dated November 25th, 1938, for the constitution of National and District Joint Committees of Local Authorities and Chief Electrical Engineers for the Electricity Supply Industry. It was provided that members should retire annually on December 31st, but should be eligible for re-election.

The 1941 Agreement

In July, 1941, an agreement was made by the National Joint Committee in which salaries were laid down in accordance with "unit assessments," account being taken of the differences between "retailed" electricity, that sold in bulk and to large consumers, and that sold which was purchased in bulk but not re-sold in bulk or to large consumers. "Grid units" were also specially assessed.

The Association of Municipal Corporations says that under its constitution the National Joint Committee has no power to enter into any agreement and even in the unlikely event of this agreement being considered a recommendation there has been no compliance with Clause 5 of the Committee's constitution. This clause provides that in making recommendations the Committee "shall have regard to the conditions and nature of the organisation under which the undertakings of the local authorities are operated."

It is agreed that, to the extent that an engineer's salary should be based on the quantity of electricity supplied, the correct principle has been followed, but the Association considers that units sold are not the sole criterion. Doubts are also expressed as to whether the National Joint Committee was properly constituted but the Association does not pursue the matter further "at this stage."

The report then refers to the Conditions of Employment and National Arbitration Order, 1940, and to the decision of the House of Lords in the Bolton case which appears to make the expression "workmen" in the Order applicable to electrical engineers and the expression "trade dispute" include disputes in the performance of the functions of a local authority. It is stated that numerous letters have been received by the Association objecting to the agreement of 1941, and particularly to the increases which will be made in the salaries of chief electrical engineers, which in some cases are substantial. A table is included in the report to show the extent to which the agreement has been adopted.

It is recognised that the size of the undertaking and the responsibility of the engineer are matters to be taken into consideration in determining his salary, and for this purpose the sale of units, as adjusted in the agreement, is a useful guide. But there are, states the Association, other important factors such as the skill and ability of the engineer and his duties ; for instance, he may be responsible for the rendering and collection of accounts, or the responsibility may rest with the borough treasurer. Again, the engineer may be responsible for the stand-by plant and that might not be reflected in the number of units sold. Another factor which ought to be taken into account is the rate of salaries paid to other principal officers of the authority.

The conclusion is reached that as the agreement is not, and was not intended to be, binding on all local authorities who are electricity undertakers, it is clear that it must devolve upon each corporation to negotiate the salary to be paid to its engineer with due regard to all relevant circumstances.

Employers' Representatives' Reply

The employers' representatives on the National Joint Committee have replied to the report in a document signed by Alderman W. Walker (employers' chairman) and Mr. A. H. Banks (employers' hon. secretary). They point out in the first place that they do not acknowledge the Association of Municipal Corporations as a body competent to express an opinion on matters relating to a highly technical industry ; 42 per cent. of the membership are not authorised electricity undertakers.

The employers' representatives' only comment upon the "historical" part of the report is that the salaries under the 1941 agreement are 10 per cent. less than those under the 1921

agreement. With regard to the Committee's powers to make agreements, the employers say that all Whitley Council "agreements" are recommendations because legally the two sides of the Council are not competent contracting parties. They only become agreements when adopted by the constituent members.

In view of the elaborate provisions dealing with the devaluation of units supplied in special circumstances, the Association's reference to the Committee's disregard of the conditions and nature of the organisation under which local authority undertakings operate is not understood.

With regard to the Association's qualifications to its agreement that the electricity-sold basis is a correct one, the employers' representatives reply as follows :—The difficulty of assessing the value of individual skill is common to every agreement concerning salaries of administrative staff and, in fact, of workpeople also. If an engineer for some part of his time is doing financial work he is doing the work of a highly-skilled officer (treasurer); if he is not he must be fully occupied with his engineering duties. The point relating to units from stand-by plant is specifically dealt with in the agreement.

N.J.B. and N.J.I.C. Precedents

As regards the salaries of other chief officers, the employers' representatives are not concerned with this question which is best dealt with by those persons more competent to decide. Similarly, they hope that their recommendations on a subject upon which they are best able to form an opinion will receive the same support as has been given to acts of the National Joint Board and National Joint Industrial Council. These bodies differ from the National Joint Committee in that they represent both local authorities and companies. But it has to be borne in mind that the employers' representatives have some knowledge of the value placed upon the services of chief electrical engineers by directors of companies.

As to the doubts expressed about the Joint Committee's constitution, the employers' representatives show that a draft constitution was circulated in 1938 to the various District Committees appointed by the local authorites in the districts and following difficult and protracted negotiations a draft agreement was evolved. In every case the necessary data was obtained from the clerk to the local authority. The draft agreement was provisionally concluded in 1941 and circulated for observations and approval and suggested amendments, some of which were adopted. The agreement was finally signed on July 9th, 1941. The procedure followed that adopted by the N.J.B. and N.J.I.C. twenty-four years ago and it is pointed out that many of the arguments put forward in the Association's report were originally made against the activities of these two organisations by undertakers who for many years have been loyal members.

Figures are given to show that the 122 undertakers which have adopted the agreement, are paying salaries equal to or in excess of the scale, or have mutually agreed salaries with their engineers, represent 47·2 per cent. of the units sold by all local authorities in the country. Those who have given a definite decision against adopting the agreement represent only 22·4 per cent. of the units sold.

Red Cross Appeal

WE have received from the organisers of the Electrical Industries Red Cross Appeal a further list of covenanted subscriptions and donations which bring up the total to £14,525. The list (which is the seventh) is printed below:—

Covenanted Subscriptions (gross)

	£	s.	d.
Brought forward ..	8,345	12	0
Mullard Radio Valve Co., Ltd. ..	300	0	0
City of Wakefield	25	0	0
F. W. Tomlinson, Durham ..	21	0	0
	£8,691	12	0

Donations

	£	s.	d.
Brought forward ..	5,775	10	9
E. R. & F. Turner, Ltd.	14	13	3
Borough of Stockton-on-Tees ..	10	10	0
James Kilpatrick & Co., Ltd. ..	10	0	0
Corporation of Eccles	10	0	0
Standard Wholesale Electrical Co., Croydon	5	5	0
County Borough of Stockport ..	5	0	0
Fred Wood & Son, Birmingham	2	2	0
	£5,833	1	0

E.D.A.'s Post-War Aims

AN interim statement on post-war policy was made this week by Mr. E. E. Hoadley, chairman of the British Electrical Development Association. In it a number of principal objects are put forward and reference is made to the fact that E.D.A. is in process of strengthening its organisation in preparation for peacetime and seeking for a director who will act as the "ambassador of the industry" in all matters of electricity supply and utilisation.

The objects mentioned are the standardisation of voltage; standardisation of forms of tariffs; facilities for hire-purchase of apparatus and its maintenance by the supply authorities; development of the industrial off-peak load; technical service for industrial consumers to help them with their problems; and increased facilities to the public for advice and guidance from supply authorities, which is said to be a logical development of the industry's wartime policy of working with the Government in such matters as the food and fuel-saving campaigns.

Infra-Red Heating

I.E.E. Informal Discussion

THE Institution of Electrical Engineers' last informal meeting of the session was held on April 19th, with Mr. P. P. Wheelwright in the chair, when Mr. F. E. Rowland opened a discussion on "Infra-red Lamp Heating and its application to Industrial Purposes." The speaker said that the principal advantage of infra-red lamp heating was that the heat was transferred directly from the source of energy to the object to be heated without raising the temperature of the intervening atmosphere; consequently heating up of the object was extremely rapid. The plant was easy to install, occupying little space and in general it did not require special foundations. No time was wasted in preliminary heating up as the plant was ready for immediate use when switched on.

Lamps were employed as a source of heat because they provided an efficient and powerful source of infra-red energy whilst the glass bulb not only served to enclose the filament in a suitable gas, but also reduced convection losses. The small dimensions of the filament provided a highly concentrated source which enabled the radiation to be controlled by suitable reflectors. The lamps were rated at 115 V 250 W, this type having been standardised for convenience of wartime manufacture. The 115-V standard had been adopted because it might be used on the power supplies in general use by grouping lamps suitably, an added advantage being the more robust filament.

Reflector Systems

The lamps were run at a lower efficiency than that used for lighting which increased their life, whilst the consequent loss in luminous efficiency was not a disadvantage. Originally, parabolic reflectors were employed and they were still largely used, but Mr. Rowland dealt with a technique, with which he had been associated, which employs trough reflectors, each containing a number of lamps. With this system lamps might be spaced in much closer formation to give a greater energy concentration in a given area. In a complete plant the troughs were built up into banks with an unbroken reflecting surface. The contour of the banks of reflectors had to be carefully designed to suit each particular application, and they might be rigid or adjustable according to the special requirements.

With the equipment at present available, temperatures of from 500 to 600 deg. F. were obtainable, the precise temperature depending on the material and article being heated. For instance, 20 gauge sheet steel with a dull black surface would reach a temperatrue of 500 deg. in 2 or 3 minutes, this surface absorbing radiation more readily than one which was brightly polished and light coloured and it would moreover reach a higher maximum temperature.

At present the most important application of infra-red lamp heating was paint drying. Low-temperature stoving enamels, with a drying time of 60 minutes in a convection oven could be dried in 10 minutes by infra-red and a reduction of 90 per cent. in time was by no means uncommon. Whilst this process was applicable to many air-drying paints and oil-based stoving enamels, it was particularly applicable to synthetic resin materials. In many cases, satisfactory results could be achieved without departing materially from paints previously employed for air-drying or convection drying, whilst in other cases it might be advantageous to use a paint of a different formulation. Amongst other applications to which this technique might be applied were the softening of plastics for punching, moulding, etc., the evaporation of moisture from textiles and wooden veneers, and the drying of printing inks.

Some Limitations

In the ensuing discussion twenty-two speakers took part, and many questions were asked. In reply, Mr. Rowland stated that infra-red heating could be employed for softening laminated bakelite sheet prior to punching. The drying of enamel on fine wire could be performed more effectively by other means. Infra-red heating was most easily applied to the treatment of similar articles on a conveyor although it could be adapted to handling a wider range of products within certain limits. When it was desired to treat a considerable variety of articles in smaller quantities, which varied widely in shape, convection heating was more adaptable. The equipment at present available was not flameproof and, consequently, was not suitable for use in places where very low flash-point solvents were present.

Following the opener's remarks on the use of trough reflectors, reference was made to those of the circular type, and it was pointed out that with this pattern a large collection angle was obtainable.

It was also stated that the design and manufacture of plant presented a number of technical problems, for the solution of which considerable experience and knowledge were essential.

ELECTRICITY SUPPLY

Gas and Electricity at Ashton. Views on J.E.A. Scheme.

Ashton-under-Lyne.—GAS COMPANY'S PURCHASE PROPOSAL.—Discussion took place at a meeting of the Town Council on a proposal by the parent company of the Ashton Gas Company to acquire the Corporation's electricity undertaking.

Recently a deputation of gas interests waited on the Corporation Finance Committee and stated that, in consideration of post-war developments, the gas industry has been requested by the Ministry of Fuel and Power to formulate plans for the reorganisation of the industry, and they were exploring the possibility of the merging of gas and electricity interests. In connection with the proposal to acquire the Corporation's electricity undertaking, their outline of the financial arrangements suggested that the balance of the cost of acquisition should be met by the issue to the Council of preference shares in the company controlling the concern. Also it was proposed that the Council should appoint representatives to act as directors, thus giving the consumers, through the Council, representation in the direction and control of the undertaking. The deputation stated that, if their proposals were favourably received by the Town Council, it was proposed to open negotiations on similar lines with other local authorities with the object of establishing a regional scheme which might be acceptable to the Ministry.

The Town Clerk suggested that the establishment of a public utility corporation to take over both the electricity undertaking and the Ashton Gas Company might be more favourably received by the Town Council, and Col. Evett (representing the gas interests) did not decline to accept this proposal. The Town Council appointed representatives to consult the local Member of Parliament with regard to the scheme.

It may be recalled that last year negotiations were in progress with the Stalybridge, Hyde, Mossley and Dukinfield Joint Transport and Electricity Board, whose chief engineer, Mr. J. H. Lumsden, for a time acted in a temporary supervisory capacity (*Electrical Review*, October 16th, 1942). The Corporation informed the Board that it " was not prepared to part with its electricity undertaking and not have a voice in the distribution of electricity in the town." The Board agreed to continue negotiations but pointed out that under its existing powers acquisition of the undertaking was not incompatible with the Corporation's desire to have a voice in the policy of distribution of electricity in Ashton.

Chester.—SUBSTATION EQUIPMENT.—The Electricity Committee is to install a transformer and switchgear at a substation, at a cost of £400.

Fort William.—CHURCH HEATING PROBLEM.—The Town Council was recently informed by a church minister that the tariff quoted for heating the church was too high and that it had been decided to abandon the scheme. At the Council meeting it was stated that if the heating were used on one day only during the week the council would be exceeding the maximum demand figure, resulting in the payment of about £26 to the British Aluminium Co. for that excess. Councillors criticised the system, pointing out that the Council could not supply electricity to churches and other similar bodies at an economic price because of this maximum demand figure, and it was urged that representations should be made to the company to have the matter revised. The Council agreed to go further into the question.

Irthlingborough (Northants).—STREET LIGHTING.—The Urban Council is to arrange with the Rushden Electric Supply Co., Ltd., for additional lamps for the next lighting season.

London.—VIEWS ON J.E.A.'s PROPOSALS.—Last week the St. Pancras Electricity and Public Lighting Committee, having considered a memorandum by the chief engineer and manager (Mr. R. Lee) on the J.E.A.'s unification proposals, supported the general principles of the merger of electricity undertakings under public ownership and control with a view to the improvement and cheapening of supply. Without knowledge of what the Government had in mind in regard to electricity distribution after the war, however, the Committee was not prepared at the present stage to express approval of the proposals contained in the J.E.A.'s report.

A sub-committee has been appointed by the Stoke Newington Emergency Committee to consider and submit recommendations on the report of the J.E.A.

CLOSURE OF RESERVE FUND.—At last week's meeting of the Stoke Newington Council the Emergency Committee recommended that the balance standing to the credit of the electricity reserve fund should be utilised in meeting the deficiency on the net revenue account. The effect of closing the reserve fund, it was pointed out, would be that the income and expenditure of the undertaking would, for the time being, form part of the general rate fund for the purpose of any application to the Ministry of Health for financial assistance.

HAMMERSMITH FINANCES.—The Executive Committee of the Hammersmith Borough Council reports that the financial position of the electricity undertaking, as shown in the estimates for 1943-44, is considered satisfactory and, subject to present conditions continuing, there will be no necessity to increase the charges during the current financial year.

Newcastle-under-Lyme.—SHELTER LIGHTING.—The Town Council is to have electric lighting installed in shelters at Vessey Terrace, Pool Dam, and Ryecroft.

Salisbury.—OPERATION OF HYDRO-ELECTRIC PLANT.—During the winter it was reported to the Catchment Board that the water impounded by the Salisbury Electric Light & Supply Co., Ltd., at Downton (where the company has a small hydro-electric plant on the River Avon) was considerably above the permissive height as determined by the High Court in 1927. It was decided to inform the company that unless the Board's directions were complied

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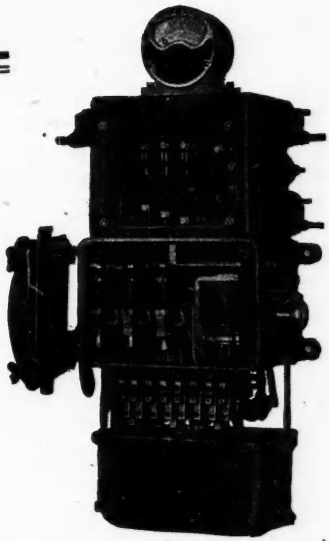

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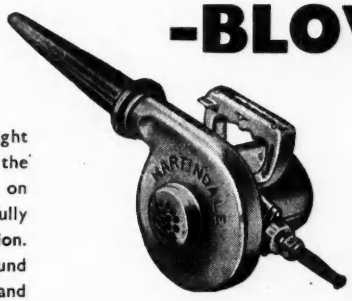

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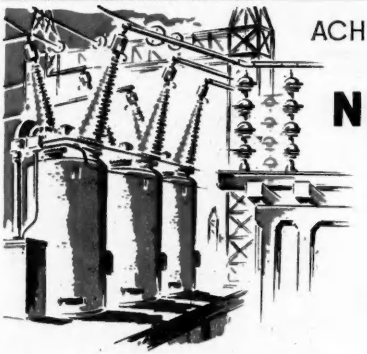

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with within seven days proceedings would be instituted. In a later report the engineer advised that as a result of subsequent recordings no action was necessary. He added that although the Board had been informed that its action had caused a reduction in the output of electricity by water power, it would be appreciated that it had materially improved the food production position.

Salford.—ELECTRICITY CHARGES.—The Light, Heat and Power Committee has decided to submit additional information to the Electricity Commissioners in connection with an application by the Committee for permission to increase certain charges for electricity in the city.

Scarborough.—SUBSTATIONS.—Sanction has been obtained by the Town Council to borrow £769 for substations and equipment.

Sheffield.—EXTENSIONS.—The Town Council proposes to extend the electricity supply in certain streets at a cost of £6,440.

Sunderland.—H.V. SUPPLY.—The Town Council is to spend a further £3,000 on an extra high voltage supply of electricity to an industrial undertaking.

Overseas

Canada.—GRANTS FOR RURAL EXTENSIONS.—The Quebec Provincial Government's plan to promote rural electrification will have its first beneficiaries in the municipalities of Ste. Anne des Monts and Cap Chat, the mayors of which were in conference in Quebec recently with the Premier, Mr. Adelard Godbout, and asked that their municipalities should be given the benefit of the new Government plan. A grant equalling 50 per cent. of the cost of constructing transmission and distribution lines was promised by the Premier. He also promised that the Government would lend the municipalities a sum equal to another 25 per cent. of the cost, leaving them to provide only 25 per cent. The electricity will be purchased from the Lower St. Lawrence Power Co.

RECORD ONTARIO OUTPUT.—Dr. T. H. Hogg, chief engineer of the Hydro-electric Power Commission of Ontario, stated recently that with all available power resources operating at maximum capacity, output last year—11,675 million kWh—exceeded all previous records by 11·5 per cent.

France.—NEW POWER STATIONS.—In a recent issue of *La Vie Industrielle* details are published of a new hydraulic plant under construction on the Dordogne. Work on the barrage and power houses is now proceeding. Cement has to be brought 10 kilometres and is carried by means of a telpher railway. The electrical installation, which is now well on the way to completion, comprises four main 12,000-V, 50,000-kW generators.

It is reported that a new power station at Vizile-sur-Vezere, in the Massif Central, is expected to be ready by the end of the year. The work has been carried on for two years and the finished station will be capable of generating 50 million kW annually.

Germany.—LARGE HYDRO-ELECTRIC GENERATOR.—The German-controlled Oslo radio recently stated that a generating unit, described as the biggest in the world, was being manufactured by a German firm for a foreign hydro-electric undertaking in Europe.—*Reuter.*

Forthcoming Events

Institution of Electrical Engineers.—Thursday, May 13th, 5.30 p.m. Annual general meeting. 6 p.m. (approx.). Paper: "Standardisation of Motor Dimensions," by Mr. H. Marryat.

Wireless Section.—Wednesday, May 5th, 5.30 p.m. Paper: "The Frequency Synthesiser," by Mr. H. J. Finden.—Tuesday, May 11th. Extra informal meeting.

Installations Section.—Thursday, May 6th, 5.30 p.m. Paper: "The Protection of Structures Against Lightning," by Mr. J. F. Shipley.

Transmission Section.—Wednesday, May 12th, 5.30 p.m. Papers on "Protective Systems for Rural Distribution up to 33 kV," by Messrs. D. C. Field, B.A.; O. Howarth; and R. W. Steel and A. W. Allwood, B.Sc. Paper on "Automatic Selective Isolation of Sustained Earth Faults on Networks Protected by Petersen Coils," by Mr. K. I. Brown.

Measurements Section.—Friday, May 21st, 5.30 p.m. Lecture on "Measurement of Small Quantities," by Dr. E. H. Rayner, M.A.

Bristol Students' Section.—Friday, April 30th, 7.15 p.m. Pump Room, Bath. Informal discussion on "Specialisation," to be opened by Mr. J. B. Harris.

London Students' Section.—Saturday, May 1st, 6–10 p.m. Lysbeth Hall, Soho Square, W.1. Dance (tickets, 3s. 6d. single; 6s. 6d. double).

North Midland Students' Section.—Saturday, May 1st, 2.30 p.m. Griffin Hotel, Leeds. Paper: "A Gas-filled Cable System," by Mr. B. Calvert, B.Sc. (Eng.).

South Midland Centre.—Monday, May 3rd, 6 p.m. James Watt Memorial Institute, Birmingham. Informal discussion on "The Shape of Things to Come," to be opened by Mr. H. Hooper.—Monday, May 10th. Annual general and informal wireless meeting.

South Midland Students' Section.—Monday, May 17th, 7 p.m. James Watt Institute, Birmingham. Paper: "Some Applications of Optics to Engineering," by Mr. M. H. Taylor, M.I.Mech.E. (Joint meeting with Graduates' Section of the Institution of Mechanical Engineers).

North-Western Centre.—Tuesday May 4th, 6 p.m. Engineers' Club, Manchester. Annual meeting and paper on "Busbar Protection," by Messrs. M. Kaufmann and W. Szwander.

Western Centre.—Monday, May 10th. Cardiff. Paper: "The Application of Electricity to Mine Pumping," by Messrs. G. B. Alvey and N. Tetlow.

Nottingham Society of Engineers.—Monday, May 3rd. Corporation Gas Showrooms, Parliament Street. Lecture on "Gear Cutting," by Mr. F. J. Everest, M.Sc., A.M.I.E.E., A.M.I.Mech.E.

Junior Institution of Engineers.—*Midland Section.*—Wednesday, May 5th, 6 p.m. James Watt Memorial Institute, Birmingham. Paper: "Compilation of Technical Papers and Lectures," by D. W. Wilson, M.I.E.E.

Union des Ingénieurs et Techniciens de la France Combattante.—Thursday, May 6th, 5 p.m. Institution of Mechanical Engineers, Storey's Gate, S.W.1. Lecture on "The Monetary Problem in France after the War," by Lieut. A. Duval. British and Allied engineers are invited to take part in the discussion, either in English or French.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The Telegraph Construction & Maintenance Co., Ltd., reports a net profit for 1942 of £49,365, as compared with £50,825 for 1941. The balance is struck after making provision of £270,000 for taxation (against £93,298 for the previous year). As already reported the dividend for the year is maintained at 10 per cent., less tax, reserve for contingencies receives £23,675, and £43,451 is carried forward (against £40,572 brought in).

The annual meeting was held on April 20th, when Mr. Colin F. Campbell (chairman) said that the works had been occupied during the year beyond their normal capacity and the output had exceeded all expectations. The board had taken every precaution to maintain the efficiency of the plant and machinery, but they would, in time, be faced with heavy commitments for renewals. Provision for these should be made now, but the excessive demands for taxation precluded them from doing all that was required. They did, however, look forward to the repayment of 20 per cent. of the excess profits tax after the war in view of the assurances of the Government in this respect; this would help them to effect the necessary replacements. Shareholders would be pleased to learn that both the manager and the engineer of the Selborne Estate had been reported fit and safe in enemy hands.

The Telegraph Condenser Co., Ltd.—In a statement circulated with the report and accounts, Mr. W. H. McFadzean (chairman) says that the company achieved an increased output in 1942, but higher charges and the heavy incidence of E.P.T. have left the profits virtually unchanged. Since the last annual meeting a considerable reorganisation affecting all departments has been carried out within the company, and in addition to reopening the pension scheme to all staff and workpeople after certain minimum service with the company, a staff profit-sharing scheme has been introduced under which all but the junior staff will participate in the trading profits of the company.

Heatrae, Ltd., reports a profit for the year to February 28th of £25,308, as compared with £15,800 for the previous year, and after providing for depreciation, taxation, etc., a net profit of £14,277 (against £9,897). After deducting £2,000 in further reduction of the book value of the goodwill, £2,500 in creating a stock reserve account for provision against possible post-war depreciation in values, and other sums for various purposes, it is proposed to maintain the ordinary dividend for the year at 12½ per cent., less tax, and to carry forward £8,752 (against £7,677 brought in).

The Oriental Telephone & Electric Co., Ltd., reports a net profit for 1942 of £34,941, as compared with £96,279 for the previous year. The dividend for the year is 4 per cent. (against 10 per cent.).

Murex, Ltd., has announced an interim dividend of 7½ per cent. (unchanged).

Allen West & Co., Ltd., report a net profit for the year to January 31st of £50,829, as compared with £50,195 for the preceding year. The first and final dividend remains unchanged at 7½ per cent.

The Brush Electrical Engineering Co., Ltd., is paying an ordinary dividend for 1942 of 8 per cent., less tax (against 6 per cent.).

The Atlas Electric & General Trust, Ltd., has declared a dividend of 3½ per cent. on its 7 per cent. cumulative preference shares, making the full dividend for the past year.

Broom & Wade, Ltd., are again paying an interim dividend of 7½ per cent.

The Pressed Steel Co. Ltd., is to pay a final dividend of 17½ per cent., maintaining the year's distribution at 22½ per cent.

The Cables Investment Trust, Ltd., announces the payment of an interim dividend of 2 per cent. (same).

The British Columbia Telephone Co. is again paying an ordinary dividend of 8 per cent. The operating revenue for 1942 was $7,166,626 (against $6,547,552) and the net revenue $756,957 ($782,102).

New Companies

Crescent Electric and Development Co., Ltd.—Private company. Registered April 16th. Capital, £10,000. Objects: To carry on the business of financiers, electrical and general engineers, contractors, builders' and engineers' merchants, property dealers and developers, etc. Subscribers: W. F. Leeks and G. D. Cheeseman, both of 87, Regent Street, W.1. Registered Office: Kent House, 87, Regent Street, London, W.1.

Electric Plant Installations (Birmingham), Ltd.—Private company. Registered April 16th. Capital, £1,000. Objects: To carry on the business of electrical wiring contractors, electrical and mechanical engineers, dealers in electrical goods, etc. Directors: J. Hassall, 70, Lower Essex Street, Birmingham, and C. Morris, Medina Road, Tyseley, Birmingham. Registered Office: 11, Oakham Road, Harborne, Birmingham, 7.

S. A. Fisher & Co., Ltd.—Private company. Registered in Belfast April 5th. Capital, £2,000. Objects: To carry on the business of electricians, mechanical engineers, manufacturers of, and dealers in, electricity, radio, light and power, etc. Subscribers: S. A. Fisher, 17/19, Queen Street, Belfast; and Margery W. Stevenson, 8, Mayfair, Arthur Square, Belfast. Registered office: 10, Scottish Provident Buildings, Belfast.

Betteridge Bros., Ltd.—Private company. Registered April 9th. Capital, £4,000. Objects: To acquire the business of radio and electrical engineers carried on by Betteridge Bros. at Weston-super-Mare. Directors: L. C. Betteridge and Annie G. Betteridge, both of 44, Quantock Road, Weston-super-Mare. Registered office: 16, Wallacote Road, Weston-super-Mare.

Marshall's (Engineers), Ltd.—Private company. Registered April 7th. Capital, £2,000. Objects: To carry on the business of electrical, radio, motor, agricultural and general engineers, manufacturers of, and dealers in, motor parts and accessories, mechanical fittings, etc. Directors: W. Marshall and Mrs. Ellen L. Marshall, both of 3, River View, Hebden Bridge. Registered office: Bridge Gate, Hebden Bridge, Yorks.

Dalmarnock Electrical & Engineering Co., Ltd.—Private company. Registered in Edinburgh April 10th. Capital, £200. Objects: To carry on the business of manufacturers, repairers, assemblers and installers of scientific and chemical units, etc. Directors: H. McGowan, 223, Nuneaton Street, Glasgow, and J. McGowan, 426, Matheson Street, Glasgow. Registered office: 320, Nuneaton Street, Glasgow.

Exchange Battery Service, Ltd.—Private company. Registered April 17th. Capital, £500. Objects: To carry on the business of manufacturers of, and dealers in, accumulators, dry cell and other batteries, acids and containers, wireless and television sets, etc. J. S. White, 41, Grangepark Road, Manchester, 9, is the first director. Registered office: 4, Nelson Street, Manchester, 13.

Ford Chapman & Co., Ltd.—Private company. Registered April 9th. Capital, £1,000. Objects: To carry on the business of dealers in, and agents for, electrical plant and apparatus, general merchants, importers and exporters, etc. Directors: T. J. Chapman, 17, Woodford Avenue, Ilford and J. S. Walford, 31, Longwood Gardens, Ilford. Solicitors: Ernest G. Scott & Co., 31-2, Broad Street Avenue, E.C.2.

Companies' Returns

Statements of Capital

Perak River Hydro-Electric Power Co., Ltd.—Capital, £3,500,000 in £1 shares (1,250,000 5 per cent. cumulative preference, 1,750,000 ordinary and 500,000 "A"). Return dated December 30th. 1,250,000 preference and 1,750,000 ordinary shares taken up. £808,041 paid. £2,191,959 considered as paid. Mortgages and charges: £693,000.

Keighley Electrical Engineering Co., Ltd.—Capital, £10,000 in 3,000 preference and 7,000 ordinary shares of £1. Return dated December 8th. 2,300 preference and 4,256 ordinary shares taken up. £4,544 paid on 1,900 preference and 2,644 ordinary shares. £2,012 considered as paid on the remainder. Mortgages and charges: £7,000.

Lancashire Telephone Systems, Ltd.—Capital, £10,000 in 5,000 8 per cent. participating preference and 5,000 ordinary shares of £1. Return dated January 14th (filed November 26th). 700 preference and 5,000 ordinary shares taken up. £5,080 paid on 700 preference and 5,380 ordinary shares. £620 considered as paid on 620 ordinary shares. Mortgages and charges: Nil.

Shipton Automatic Telephone System, Ltd.—Capital, £100 in £1 shares. Return dated December 31st, 1942 (filed March 12th, 1943). 3 shares taken up. £3 paid. Mortgages and charges: Nil.

Tubes, Ltd.—Capital, £215,000 in £1 shares. Return dated January 2nd. All shares taken up. £107,584 paid (£1 on 82,859 and 10s. on 49,450 shares). £107,416 considered as paid (£1 on 82,691 and 10s. on 49,450 shares). Mortgages and charges: Nil.

Accumulators of Woking (1928), Ltd.—Capital, £10,000 in £1 shares. Return dated March 16th. 8,501 shares taken up. £4,501 paid. £4,000 considered as paid. Mortgages and charges: £8,000.

T. Barratt & Co. (Electrical Engineers), Ltd.—Capital, £1,000 in £1 shares. Return dated August 25th (filed September 22nd). 600 shares taken up. £600 paid. Mortgages and charges: Nil.

Bushing Co., Ltd.—Capital, £100,000 in £1 shares. Return dated January 1st, 1943. 80,000 shares taken up. £80,000 paid. Mortgages and charges: Nil.

Bowden & Higlett, Ltd.—Capital, £3,000 in £1 shares. Return dated December 3rd, 1942. 2,025 shares taken up. £2,025 paid. Mortgages and charges: Nil.

Ryland's Electrical Co., Ltd.—Capital, £1,000 in £1 shares. Return dated March 9th. All shares taken up. £1,000 paid. Mortgages and charges: Nil.

Electric Driers, Ltd.—Capital, £2,000 in £1 shares. Return dated January 1st, 1943. All shares taken up. £1,950 paid. £50 considered as paid. Mortgages and charges: Nil.

Bylock Electric, Ltd.—Capital, £15,000 in £1 shares. Return dated January 12th, 1943. 11,150 shares taken up. £11,150 paid. Mortgages and charges: £6,000 (approximately).

Wright Electric Motors (Halifax), Ltd.—Capital, £6,000 in £1 shares. Return dated December 31st. 4,146 shares taken up. £4,146 paid. Mortgages and charges: £1,000.

Dunmow Light & Heat Co., Ltd.—Capital, £10,000 in £1 shares. Return dated November 13th. 8,500 shares taken up. £8,500 paid. Mortgages and charges: £1,500.

Mortgages and Charges

Varley Dry Accumulators, Ltd.—Satisfaction in full on January 25th, 1943, of debenture dated March 12th, 1940, and registered April 1, 1940. (According to the register of mortgages and debentures registered April 1st, 1940, originally secured all moneys due to bank.)

Electricars, Ltd.—Satisfaction in full on November 24th, 1942, of charge by deposit of deeds dated August 25th, 1937, and registered September 7th, 1937, securing all moneys due or to become due from the company to Barclays Bank, Ltd.

Presco Electrical, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated March 25th, 1943, to secure £100. Holder: G. E. Todd, "The Gables," Oxford Road, Gerrards Cross, Bucks.

Bankruptcies

E. N. Belsten, electrical contractor, 245, Highters Heath Lane, Warstock, Birmingham.—Order made March 16th, refusing bankrupt's discharge.

STOCKS AND SHARES

TUESDAY EVENING.

STOCK EXCHANGE business remains fairly active in the departments to which public attention is more particularly directed. While the prices of purely gilt-edged securities show comparatively little change, the industrial markets attract a good deal of notice, and prices keep very firm. One of the outstanding features during the past few business days has been a further sharp rise in Cable & Wireless ordinary stock. South African mining shares having come into prominence and Victoria Falls ordinary participated with an advance to 81s. 3d. Canadian and American utilities have held their recent improvements.

Home Railway Stocks

Southern preferred stock has gained 4 points with a rise to 77½. Business has been done up to 78. London Passenger Transport "C" is again 2 points higher at 63¼. Other junior stocks in the Home Railway market are recovering the popularity which they seemed to be in danger of losing. The market is one of the few Stock Exchange departments from whose stocks satisfactory yields can still be obtained. The Home Railway gilt-edged issues are governed by the prevailing tendency in the British Government group. Southern 5 per cent. preference keeps its recent rise to 117.

British Electric Traction deferred is marked up 30 points, to 1,075. At this price, the return comes to £4 3s. 9d., against the £4 17s. 2d. offered by the company's 8 per cent. preferred ordinary stock at 170.

Electricity Supply

The improvement in tone discernible last week in the price of Home electricity ordinary shares has made no progress. If anything, the tendency is slightly easier, and a few falls of 6d. have occurred. County of London are unchanged at 38s. Clyde Valley at 39s. 6d. and Scottish Power at 38s. 6d. are 6d. down. Midland Counties have also receded to the latter price, which seems to be the standard figure for the supply companies' shares upon which the dividends are now 8 per cent.

The Overseas list contains no change of importance apart from Victoria Falls ordinary, which at 4/16 are the fraction to the good. Palestine Electric "A" at 38s. 6d. are a few pence down. Nigerian Electricity ordinary are interesting, because of the uncertainty felt as to what the final dividend will be. The interim was reduced by 1 per cent. to 3 per cent., but optimism hopes this may be restored in an addition to the final, repeating last year's dividend of 8 per cent. for the twelvemonth. The price of the shares is 21s. 6d.

Radio Shares

The recent excitement in radio descriptions has cooled down. The turnover in Cossor, E. K. Cole, Decca, Philco, E.M.I. and other such shares is continued upon a moderately large scale but violent changes in prices are no longer of daily occurrence. Cossors have been fluctuating between 20s. 6d. and 22s. 3d. At 21s., the price is 1s. lower on the week. Pye deferred 5s. shares moved up 1/16 to 22s. 6d. E.M.I. halted at 24s.; although profit-taking has been on a fairly large scale, the market in the shares remains good. For no specific reason, there is, nevertheless, a definite sympathy between the market for cinema and entertainment shares, and that of the wireless group. The increased prices for cinema seats, one result of the Budget, led to dullness in cinema shares, and the excitement in radio sympathetically subsided. Canadian Marconi shares are better at 7s. 9d., ex the dividend of 4 cents.

G.E.C.

The General Electric Company's results are usually published in June or July. Last year, the announcement came on July 17th, when a dividend of 10 per cent. was declared, plus a cash bonus of 7½ per cent., both less tax. The dividend is paid once a year. The late chairman, Lord Hirst of Witton, enjoyed a reputation for being conservative in the management of the companies with which he was identified and it may have been due to this that the dividend was reduced, from the 20 per cent. paid from 1938 to 1940 inclusive, to 17½ per cent. for the next two years. Caution looks for a repetition of this latter rate, but restoration of the previous 20 per cent. is expected—somewhat vaguely at present—to take place sooner or later.

Brush Electrical

The Brush Electrical Engineering Co. pleased, and rather surprised, its proprietors by declaring a dividend of 8 per cent. for 1942. This compares with 6 per cent. in the previous year. Prior to that, no dividend had been paid since 1930. On the announcement, the price of the 5s. ordinary shares advanced to 8s. 6d., at which the return on the money comes to £4 14s. 2d. per cent. In the six years 1931–1937 inclusive, the Brush Company sustained losses, but its fortunes thereafter took a turn for the better, and for the year ended December, 1939, the company made a profit of over £60,000. The acquisition by the company of the oil engine business of Petters, Ltd., was paid in Brush Electrical stocks and, arising out of this, option certificates were given carrying the right to subscribe to Brush ordinary shares at 20s. per £1 share until September 30th, 1943. These certificates are to bearer, and there is a

(*Continued on page* 598)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price April 27	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	57/6	−6d.	4 6 10
British Power and Light	6	7	31/–	..	4 10 4
City of London	7	7	30/–	..	4 13 4
Clyde Valley	8	8	39/6	−6d.	4 1 0
County of London	8	8	38/–	..	4 4 3
Edmundson's: 7% Pref.	7	7	34/–	..	4 2 4
Ord.	6	6	29/–	..	4 2 9
Elec.Dis.Yorkshire	9	9	44/6	..	4 1 0
Elec. Fin. and Securities	12½	12½	51/–	..	4 18 1
Elec. Supply Corporation	10	10	46/6xd	..	4 6 0
Isle of Thanet	2	Nil	16/–	..	—
Lancs. Light and Power	7½	7½	35/–	..	4 5 9
Llanelly Elec.	5½	6	26/–	..	4 12 4
Lond.Assoc.Electric	4	3	21/–	..	2 17 2
London Electric	6	6	26/6	..	4 10 7
London Power Red. Deb.	5	5	104½	..	4 15 7
Metropolitan E.S.	8	8	38/6	..	4 3 2
Midland Counties	8	8	38/6	−6d.	4 3 2
Mid. Elec. Power	9	9	43/–	..	4 3 9
Newcastle Elec.	7	7	31/–	..	4 10 5
North Eastern Elec. Ordinary	7	7	32/–	..	4 7 6
7% Pref.	7	7	35/6	..	3 19 0
Northampton	10	10	47/6	..	4 4 0
Notting Hill 6% Pref. (£10)	6	Nil	9¾	..	—
Northmet Power: Ordinary	7	7	37/–	..	3 15 8
6% Pref.	6	6	31/6	..	3 16 2
Richmond Elec.	6	6	26/–	..	4 12 4
Scottish Power	8	8	38/6	−6d.	4 3 2
Southern Areas	5	5	23/–xd	..	4 7 0
South London	7	7	26/–	..	5 7 8
West Devon	5	5	23/6	..	4 5 0
West Glos.	4½	3½	23/–	..	3 0 10
Yorkshire Elec.	8	8	40/–	..	4 0 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	4/9	..	—
Calcutta Elec.	7*	7*	34/6	..	—
Cawnpore Elec.	10	10	30/–	..	6 13 4
East African Power	7	7	32/–	..	4 7 6
Jerusalem Elec.	7	5	25/6	..	3 18 5
Kalgoorlie (10/–)	7½	5	9/–	..	5 11 1
Madras Elec.	6*	4*	24/–	..	—
Montreal Power	1½	1½	27½	..	5 7 2
PalestineElec."A"	Nil	4*	38/6	−6d.	2 1 7
Perak Hydro-elec.	6	7	9/–	..	—
Shawinigan Power	83cts.	90cts.	19	..	—
Tokyo Elec. 6%	6	6	19	..	—
VictoriaFallsPower	15	15	4	+⅛	3 14 0
WhitehallInv.Pref.	—	—	24/–	..	—

Company	Dividend Previous	Dividend Last	Middle Price April 27	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity: 1955–60 (Civil Defence)	—	3	100	..	3 0 0
1955–75	5	5	115	..	4 7 0
1951–73	4½	4½	109	..	4 2 7
1963–93	3½	3½	104½	..	3 7 0
1974–94	3½	3½	101	..	3 3 9
LondonElec.Trans. Ltd.	2½	2½	96½	..	2 11 10
London & Home Counties 1955–75	4½	4½	111	..	4 1 1
Lond.Pass.Trans.: A	4½	4½	122⅔	..	3 13 6
B	5	5	120½	..	4 3 0
C	2⅞	3	63½	+2	4 14 7
WestMidlandsJ.E.A. 1948–68	5	5	110	..	4 11 0
Telegraph and Telephone					
Anglo-Am. Tel.: Pref.	6	6	113½	..	5 5 9
Def.	1½	1½	28	..	5 7 2
Anglo-Portuguese	8	8	24/–	..	6 13 4
Cable & Wireless: 5½ Pref.	5½	5½	114½	..	4 16 1
Ord.	4	4	80	+4½	5 0 0
CanadianMarconi$1	Nil	4cts.	7/9xd	+6d.	—
Globe Tel. & Tel.: Ord.	8½*	5*	35/–	..	2 17 2
Pref.	6	6	29/3	+9d.	4 2 3
GreatNorthernTel.: (£10)	Nil	Nil	23	−½	—
Inter. Tel. & Tel.	Nil	Nil	11	..	—
Marconi-Marine	7½	7½	33/–	..	4 11 0
Oriental Tel. Ord.	16	10	37/–	..	—
Telephone Props.	6	Nil	14/–	..	—
Tele. Rentals (5/–)	10	10	11/3	+6d.	4 9 0
Traction and Transport					
Anglo-Arg. Trans.: First Pref. (£5)	Nil	Nil	5/–	..	—
4% Inc.	Nil	Nil	13	..	—
Brit.Elec.Traction: Def. Ord.	45	45	1075	+30	4 3 9
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	8	10	51/–	..	3 18 6
Brazil Traction	$½	$1	28½	..	—
Calcutta Trams	8	5½	25/–	..	4 8 0
Cape Elec. Trams	5	6	25/–	..	4 16 0
Lancs. Transport	10	10	43/3	..	4 12 4
Mexican Light: 1st Bonds	5	5	101½	..	4 18 6
Rio 5% Bonds	5	5	101½	..	4 15 9
Southern Rly.: 5% Prefd.	5	5	77½	+4	6 9 0
5% Pref.	5	5	117	..	4 5 6
T. Tilling	10	10	53/3	..	3 14 5
West Riding	10	10	43/–	+1/–	4 13 0

(Continued on next page)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price April 27	Rise or Fall	Yield p.c. £ s. d.
Equipment and Manufacturing					
Aron Elec. Ord...	7½	10	40/–	..	5 0 0
Assoc. Elec. :					
Ord.	10	10	50/–	..	4 0 0
Pref.	8	8	40/–	..	4 0 0
AutomaticTel.&Tel.	12½	12½	59/6	+1/6	4 6 2
Babcock & Wilcox	11	11	51/6	+3d.	4 5 9
British Aluminium	10	10	50/–	..	4 0 0
British Insul. Ord.	20	20	5 5/16	+1/8	3 17 3
British Thermostat (5/–)	18½	18½	17/6	..	5 5 9
BritishVac.Cleaner (5/–)	10	15	24/3	..	3 1 10
Brush Ord. (5/–)	6	8	8/6	+9d.	4 14 2
Burco (5/–) ..	15	15	14/3	..	5 5 1
Callender's ..	15	15	4 1/16	..	3 14 0
ChlorideElec.Storage	15	15	79/3	+1/–	3 15 9
Cole, E. K. (5/–)	7	10	21/3	..	2 7 0
Consolidated Signal	17	24	5 1/16	..	4 8 3
Cossor, A. C. (5/–)	15	10*	21/–	–1/–	3 11 5
Crabtree (10/–) ..	17½	17½	37/6	..	4 13 4
Crompton Parkinson Ord. (5/–) ..	30	20	25/–	..	4 0 0
E.M.I. (10/–) ..	6	6	24/–	..	2 10 0
Elec. Construction	10	10	44/–	..	4 11 0
Enfield Cable Ord.	12½	12½	57/–	..	4 7 9
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric	10	10	48/–	..	4 3 4
Ensign Lamps(5/–)	25	25	21/3	..	5 17 8
Ericsson Tel. (5/–)	22†	20†	47/6	..	2 2 2
Ever Ready (5/–)	40	40	38/6	..	5 4 0
Falk Stadelmann	7½	7½	30/6	..	4 18 4
Ferranti Pref. ..	7	7	28/9	..	4 17 5
G.E.C. : Pref. ..	6½	6½	34/3	..	3 16 0
,, Ord. ..	20	17½	89/–	..	3 18 8
Greenwood&Batley	15	15	38/–	..	8 0 0
HallTelephone(10/–)	12½	12½	26/3	+6d.	4 17 0
Henley's (5/–) ..	20	20	25/6	..	3 18 6
4½% Pref. ..	4½	4½	23/–	..	3 18 3
Hopkinsons ..	15	15	57/3	..	5 4 5
India Rubber Pref.	5½	5½	20/–	..	5 10 0
Intl. Combustion	30	30	6½	.. ..	4 17 10
Johnson & Phillips	15	15	69/–	+1/–	4 8 3
LancashireDynamo	20	22½	88/9	..	5 1 5
Laurence,Scott(5/–)	15	12½	12/–	..	5 4 2
London Elec.Wire	7½	7½	31/6	..	4 15 3
Mather & Platt	10	10	50/–	..	4 0 0
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	5 7/16	..	3 13 6
Pye Deferred (5/–)	25	25	22/6	+1/8	5 11 1
Revo (10/–) ..	20	17½	35/–	..	5 0 0
Reyrolle ..	12½	12½	65/9	..	3 16 0
Siemens Ord. ..	7½	7½	30/3	..	4 19 2
Strand Elec. (5/–)	4	7½	6/6	..	5 15 5
Switchgear & Cowans (5/–) ..	10	20	15/–	..	6 13 4
T.C.C. (10/–) ..	5	5	15/–	..	3 6 8
T.C. & M. ..	10	10	47/–	..	4 5 1
TelephoneMfg.(5/–)	9	9	12/–	..	3 15 0
Thorn Elec. (5/–)	20	20	20/6	–9d.	4 14 1
Tube Investments	23¾	20	93/6	..	4 5 6
Vactric (5/–) ..	Nil	Nil	13/–	–3d.	—
Vickers (10/–) ..	10	10	20/9	..	4 16 5
WalsallConduits(4/-)	55	55	45/–	..	4 17 9
Ward & Goldstone (5/–)	20	20	22/6	..	4 9 0
WestinghouseBrake	10	12½	63/6	..	3 18 9
West, Allen (5/–)	7½	7½	7/3	+6d.	5 11 2

* 5 per cent. tax-free.

† Dividends free of Income Tax.

Stocks and Shares (*Continued from page* 596)

market in them on the basis of 12s. for the £1 unit. This is equivalent to 8s. for the existing Brush 5s. units.

Cable & Wireless

Cable & Wireless ordinary stock spurted sharply upon circulation of an expectation that the dividend, shortly to be declared, will be raised from the previous 4 per cent. to a possible 5 per cent. Seeing that the declaration will be made very soon, no useful object can be served by entering into argument as to whether the dividend should be kept at 4 per cent., or whether it will be raised to 4½ or 5. On several occasions last year, it was pointed out that from the point of view of intrinsic value, Cable & Wireless ordinary was probably worth something between 60 and 70, notwithstanding the fact that a large portion of the company's normal business is temporarily out of action by reason of enemy activities in the Far East. This factor is compensated for, to some extent, by economies which have been introduced into the working of the system, and by the development of business in other directions. For some time past, there has been a substantial seller on the market, turning out his stock by amounts of £5,000 and £10,000 at a time on every rise of two or three points. This selling has now been completed, and, freed from the likelihood of being swamped with large lines of stock, the market has been able to respond to the steady demand of speculative investment, a demand that has been quickened, as already noted, by optimistic talk concerning the size of the forthcoming dividend.

Oriental Telephone

The Oriental Telephone & Electric Co. will hold its meeting on May 21st, when a dividend of 4 per cent. on the ordinary shares is to be recommended. This goes against 10 per cent. in 1941, but under the scheme sanctioned by the Court at the end of last year, the preference shares were repaid and 100 per cent. bonus on the ordinary was allowed. The company is a large holder of British Government and other securities, the value of which is calculated to be fully 38s. per share. A dividend of 4 per cent. is by no means bad, though it would scarcely of itself justify the price standing at 38s.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

AKT.-GES. Brown, Boveri & Cie.—"Arrangement for transmitting communications." 16449/40. July 14th, 1939. (552414.)

F. D. Bliley and C. Collman.—"Piezo electric crystal apparatus." 7098/41. July 1st, 1940. 552386.

British Insulated Cables, Ltd., E. S. Hargreaves and H. M. Steward.—"Machine for carrying out pressing and other operations on strip material." 11131. September 1st, 1941. (552392.)

British Thomson-Houston Co., Ltd. (General Electric Co.).—"Operation of gas-blast electrical circuit-breakers." 13683. October 24th, 1941. (552461.)

British Thomson-Houston Co., Ltd., and H. R. Ruff.—"Circuit arrangements for operating discharge lamps." 659. January 16th, 1942. (552494.)

British Thomson-Houston Co., Ltd., H. R. Ruff and M. G. Clarke.—"Means for use in connection with the coating of electrodes of electric-discharge devices." 15447. December 1st, 1941. (552468.)

J. A. Crabtree & Co., Ltd., H. F. McLoughlin, W. E. Hill, R. W. Morgan and T. D. G. Wintle.—"Electric wiring systems." 12883. October 6th, 1941. (552502.) "Couplings for electrical wiring systems." Cognate applications 12884/41 and 120/42. October 6th, 1941. (552503.) "Connectors or links for electrical wiring systems." 16224. December 16th, 1941. (552513.) "Methods of and means for testing electrical wiring systems." Cognate applications 2212/42 and 16223/41. October 6th, 1941. (Divided out of 552503.) (552516.) "Electrical fuse-holders." 2213/42. October 6th, 1941. (Divided out of 552503.) (552517.) "Busbars or connecting links for use in electrical wiring systems." 2214/42. October 6th, 1941. (Divided out of 552503.) (552518.) "Indicating means for testing electrical circuits." Cognate applications 2216/42 and 118/42. December 16th, 1941. (Divided out of 552516.) (552519.) "Terminal ends of electrical conductors." Cognate applications 2217/42 and 119/42. October 6th, 1941. (Divided out of 552503.) (552520.) "Boxes for housing electric couplings, fuses and the like." Cognate applications 2218/42 and 2219/42. October 6th, 1941. (Divided out of 552502.) (552521.)

G. S. P. Freeman and A. F. Henson.—"Cathode-ray tubes and circuit arrangements therefor." Cognate applications 9871/41 and 2263/42. August 2nd, 1941. (552389.)

General Electric Co., Ltd., and E. H. H. Hassler.—"Torque transmitting shaft couplings." 14269. November 5th, 1941. (552408.)

A. Graham & Co., Ltd., and C. H. Vaughan.—"Audible electrical signalling devices." 253. January 7th, 1942. (552489.)

W. W. Groves (W. E. Moore).—"Electrical furnaces." 15179. November 25th, 1941. (552511.)

W. T. Henley's Telegraph Works Co., Ltd., and H. W. Breeze.—"Devices employing fuses for the protection of electric circuits." 1707/43. September 27th, 1941. (Divided out of 552030.) (552412.)

Johnson Laboratories, Inc.—"Coil-winding machines." 12702/41. October 4th, 1940. (552396.)

J. Latimer, J. E. Cross and Metropolitan-Vickers Electrical Co., Ltd.—"Electric welding apparatus." 15590. December 3rd, 1941. (552477.)

J. McDonald and G. W. B. Electric Furnaces Ltd.—"Furnaces." 12762. October 2nd, 1941. (552400.)

Marconi's Wireless Telegraph Co., Ltd.—"Frequency or phase modulation receivers." 13717/41. October 25th. 1940. (552462.) "Electric signal communication systems." 16651/41. December 27th, 1940. (552482.)

Marconi's Wireless Telegraph Co., Ltd., C. S. Cockerell, J. D. Brailsford and M. H. Cufflin.—"Directional radio receiver systems." 3462. February 23rd, 1940. (552497.)

Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken).—"Means for tuning wireless sets." 12826. October 3rd, 1941. (552403.) "Amplifier circuits having variable amplification and comprising at least one tube containing an auxiliary cathode emitting secondary electrons." 10129. August 8th, 1941. (552426.) "Circuits including two oscillators or amplifiers comprising discharge tubes and a load, the oscillator or amplifier from which the load is normally supplied being replaced by the other in the event of a disturbance." 12825. October 3rd, 1941. (552438.) "Electric insulators." 13235. October 14th, 1941. (552458.) "Blocking layer cells." 14065. October 31st, 1941. (552463.) "Mixing circuits for use in superheterodyne receivers." 33. January 1st, 1942. (552486.) "Amplifying circuit arrangements for high-frequency electrical oscillations." 527. January 13th, 1942. (552492.)

Pressed Steel Co., Ltd., and E. G. Rowledge.—"Refrigerating systems." 168. January 5th, 1942. (552487.)

Standard Telephones & Cables, Ltd,—"Electric wave guide system." 12492/41. October 11th, 1940. (552394). "Velocity-modulated tube with removable resonators." 13248/41. October 15th, 1940. (552459.)

Standard Telephones & Cables, Ltd., and C. W. Earp.—"Electric tuning arrangements." 12800. October 3rd, 1941. (552431.)

Standard Telephones & Cables, Ltd., and G. Newton.—"Remote control systems." 12661. September 30th, 1941. (552395.)

Standard Telephones & Cables, Ltd., and J. K. Webb.—"Electric insulating bodies." 12801. October 3rd, 1941. (552432.) "Electrical transformers and coils." 12802. October 3rd, 1941. (552433.)

W. W. Triggs (Niles-Bement-Pond Co.).—"Electric controls for machine tools." 289. January 8th, 1941. (552415.)

E. J. W. Watkinson.—"X-ray apparatus." 12838. October 4th, 1941. (552449.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Abertillery.—May 17th. Cables, wiring accessories, service materials, meter boards, meters, lamps for public lighting, wood poles, general maintenance material, cookers and spare parts. (See this issue.)

Birkenhead.—May 17th. Electricity Department. Cables, meters and general stores. (See this issue.)

Orders Placed

London.—ISLINGTON.—Electricity Committee. Accepted. Battery repairs (£500).—Tudor Accumulator Co. Switchgear, contract extended. —Electric Construction Co.

Swansea.—Electricity Committee. Accepted. Boiler auxiliary switch-fusegear (£1,678).—English Electric Co. Boiler l.v. auxiliary cables (£10,888).—Aberdare Cables. Turbine l.v. auxiliary cables and pilot cables (£4,048).—Callender's.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barrow-in-Furness.—Houses on New Barns site; F. L. Windridge, borough surveyor, Town Hall.

Bedford.—Additions to London Road School (£1,076); G. Young.

Birmingham.—Adaptation of Lickey Grange as School for Blind; secretary, Royal Institution for the Blind, Carpenter Road, Birmingham, 15.

Buckfastleigh.—Fire station for U.D.C.; H. V. Jones, surveyor, Council Offices.

Caernarvon.—British Restaurant; H. Evans, borough surveyor, Town Hall.

Cardiff.—Houses at Lisvane, St. Nicholas, and Llancarfan for R.D.C.; T. A. Lloyd, 6, Cathedral Road, Cardiff.

Colchester.—Wartime nursery, Sheepen Road; borough surveyor, Town Hall.

Cookham.—Houses for R.D.C.; surveyor, 38, High Street, Maidenhead.

Coventry.—Reserve Council house at Sandy Lane offices (£3,000); D. E. E. Gibson, City architect, 1a, Warwick Row.

Desborough.—Houses on selected sites for U.D.C.; A. Harris, surveyor, Council Offices.

Dundee.—British Restaurants at Constitution Hill, Hilltown Junction, and Balgay Street; city engineer, City Chambers.

Essex.—Additional accommodation at St. Peter's Hospital (£4,500); J. Stuart, county architect, County Hall, Chelmsford.

Gateshead.—Canteen, Princes Way, for the North-Eastern Trading Estates, Ltd., Team Valley Estate.

Havant.—British Restaurant at Hayling Island for U.D.C.; Engineer's Department, 1, Park Road, Havant.

Hemel Hempstead.—Houses for R.D.C.; B. Ll. Stephenson, surveyor, 2, Marlowes, Hemel Hempstead, Herts.

Huntingdon.—Emergency housing for R.D.C.; W. A. Lea and E. B. Parkinson, joint architects, Huntingdon.

Lanarkshire.—Houses (50) at Shotts (electric lighting); S. McCall, county housing architect and engineer, 29, Clydesdale Street, Hamilton.

Lancashire.—Wartime day nursery; J. Maunders & Sons, Ltd., builders, Lostock Road, Stretford, Manchester.

Leicester.—Extensions to buildings and nurses' accommodation; Secretary, Leicester Royal Infirmary, Infirmary Square, Leicester.

Lexden & Winstree.—Houses, Wakes Colne, Wormingford, Messing, Great Tey and Stanway for R.D.C.; clerk, Sir Isaac's Walk, Colchester.

Lowestoft.—Depot, Crown Meadow (£875); borough engineer.

Factory; L. A. Robinson.

Fire station, Rotterdam Road; Divisional Officer.

Manchester.—Garage, Longsight; Taylor & Young, architects, 195, Oxford Road, Chorlton-on-Medlock, Manchester.

Additions to bakery, 151, Lloyd Street South, for J. H. Dickens; C. Dain, architect, 130, Birchfields Road, Victoria Park, Manchester, 14.

Milnrow.—Houses for U.D.C.; A. S. Whipp, surveyor, Council Offices.

Morpeth.—Agricultural workers' houses (18) for the R.D.C.; Mauchlen & Weightman, architects, Saville Row, Newcastle.

Newcastle-under-Lyme.—Church at Clayton; Rev. C. J. Watkins, St. Giles' Rectory, Newcastle, Staffs.

Normanton.—Houses for U.D.C.; T. L. Copp, surveyor, Council Offices.

Rotherham.—Factory mess room, Effingham Street; J. H. Dewhurst, Ltd., butchers, 121, Kirkgate, Leeds.

Works mess room, Grange Mill Lane; British Acheson, Ltd., Wincobank, Sheffield.

St. Annes on Sea.—Adaptation of premises for convalescent home for the Derbyshire Miners' Association; H. Hicken, 98, Saltergate, Chesterfield.

Scarborough.—Additions, Cambridge Street, for A. Dixon; F. Baker, architect, York Place.

Southwell.—Houses (18) for R.D.C.; J. Ellis, clerk, 8, Westgate, Southwell, Notts.

Stevenage.—Wartime nursery; surveyor, Council Offices, 5, Orchard Road.

Stranraer.—School cooking centre for County Council; county clerk, Stranraer.

Swansea.—Canteen, Victoria Road; Swansea Sailors Society.